National Park Service
U.S. Department of the Interior

Jackson Hole Airport Agreement Extension

Final Environmental Impact Statement

Grand Teton National Park Wyoming

September 2010

FINAL Environmental Impact Statement
Jackson Hole Airport Agreement Extension

GRAND TETON NATIONAL PARK

Teton County, Wyoming

The 533-acre Jackson Hole Airport is entirely within the boundaries of Grand Teton National Park. The Jackson Hole Airport Board operates the airport under a 1983 agreement with the U.S. Department of the Interior. The agreement must be renewed to provide the airport with continued eligibility for Federal Aviation Administration funding beyond April 2013. The proposed action would be an administrative action and would not involve construction or development of any facilities.

This environmental impact statement considered two alternatives for the agreement:

Alternative 1: No Action: The airport would not be eligible for Federal Aviation Administration funding after April 2013, but would continue operations under the 1983 agreement. When the agreement expired in April 2033, the airport would be closed and the site would be restored to natural conditions.

Alternative 2: Preferred Alternative: The existing agreement would be extended for two 10-year terms, until April 2053, and the commitment to reduce airport impacts would be strengthened.

The alternatives were considered for their effects on natural soundscape; visitor use and experience; air quality; visual quality and dark skies; water quality and hydrology; wildlife and their habitats, including special concern, threatened, and endangered species; park and airport operations; public health and safety; socioeconomics; and surface and air transportation. The analysis determined that Alternative 1 would have major impacts on natural soundscape, airport operations, socioeconomics, and surface and air transportation. Alternative 2 would have major impacts on natural soundscape. Except for airport operations under Alternative 2, all of the major impacts would be adverse.

NPS contact person: Superintendent
Grand Teton National Park, attention Airport EIS
P.O. Drawer 170
Moose, WY 83012
307-739-3300

Lead agency: National Park Service, Grand Teton National Park
Cooperating Agency: Jackson Hole Airport Board

United States Department of the Interior • National Park Service

EXECUTIVE SUMMARY

Purpose and Need for Action

Purpose. The Jackson Hole Airport is on 533 acres within Grand Teton National Park. The airport operates under the terms of an agreement between the Jackson Hole Airport Board and United States (U.S.) Department of the Interior. Within the Department of the Interior, the National Park Service (NPS) administers the agreement.

The agreement was signed on April 27, 1983. The term of the agreement is 30 years, with two 10-year options, both of which have been exercised. As a result, operation of the airport currently is authorized until April 27, 2033.

The Jackson Hole Airport Board requested two additional 10-year extensions to the term of the 1983 agreement. The extensions would enable continued scheduled passenger services at the Jackson Hole Airport by allowing the airport to remain eligible for funding from the Federal Aviation Administration for an additional 20 years.

The purpose of this environmental impact statement is to evaluate the Jackson Hole Airport Board's proposal to amend the 1983 agreement by extending the authorized term by 20 years (two 10-year terms). It provides compliance with the National Environmental Policy Act of 1969; regulations from the Council on Environmental Quality (1978) for implementing the procedural provisions of the National Environmental Policy Act; and other associated laws and regulations, including laws and policies that are specific to the National Park Service.

Need. An extension to the 1983 agreement is needed to allow the Jackson Hole Airport to remain eligible for federal funding beyond the year 2013. The current agreement authorizes operation of the airport until April 27, 2033. However, under Federal Aviation Administration funding regulations, an airport must own its land or have more than 20 years remaining on its lease or agreement. Because the Jackson Hole Airport is on land owned by the U.S. government, the airport will lose its eligibility for Airport Improvement Program funding on April 27, 2013, 20 years before the 2033 expiration date of the 1983 agreement.

Airport Improvement Program grants cover 95% of eligible costs for airfield capital improvement or repair projects that enhance airport safety, capacity, or security or address environmental concerns. Over the past decade, this program funded almost $28 million in projects at the Jackson Hole Airport. Similar funding will be needed in the future to enable the airport to maintain the federal certification that allows the airport to be used for scheduled passenger service.

Background. The Jackson Hole Airport was created by the town of Jackson at its present location in the 1930s, before the site was part of Grand Teton National Park. When the airport site and surrounding lands were merged into Grand Teton National Park in 1950, continued operation of the airport was authorized by a Department of the Interior Airports Act decision. Since then, the airport has operated under a series of permits and agreements between the Department of the Interior and Jackson Hole Airport Board.

The current agreement was signed on April 27, 1983. The term of the agreement was for 30 years, with two 10-year renewal options, both of which have been exercised. As a result, the agreement expires on April 27, 2033. In addition to its term, some of the provisions of the 1983 agreement that are relevant to the proposed action are as follows.

- The airport is limited to a 533-acre site plus a specified road corridor. Within this site, the Jackson Hole Airport Board can construct buildings and other improvements only in the 28.5-acre development subzone. Infrastructure on the remainder of the airport can only be used to support aircraft operations and includes the runway, taxiway, navigational aids, service roads, and air traffic control tower.
- The runway cannot be lengthened without an amendment to the 1983 agreement.
- The airport must meet stringent noise standards that are specified in the agreement. The Jackson Hole Airport Board must implement a noise abatement plan and must continuously seek to identify and incorporate technological advances that will further reduce aircraft noise impacts in Grand Teton National Park.

The 1983 agreement has been amended twice. The July 29, 1985 amendment updated administrative provisions regarding noise control plan implementation and time allowed to resolve out-of-compliances situations, if any occurred. The July 30, 2003 amendment was needed to establish the interagency helibase within the airport boundary north of the development subzone.

The Jackson Hole Airport is the most important airport in Wyoming, accounting for more than 30% of all aviation-related jobs in the state, 40% of total annual expenditures of the state's general aviation visitors, and almost 75% of scheduled passenger enplanements (Wyoming Department of Transportation 2004; Bishop 2009). In 2009, the airport averaged about 80 daily operations (takeoffs or landings) on a year-round basis, with an average of 135 daily operations in the peak-season period of July through September and a peak day of 227 operations. Four carriers provide scheduled passenger service on 12 to 20 outbound flights per day (varying by season) using aircraft ranging in size up to the 188-seat Boeing 757. The remaining airport use is by general aviation.

The closest airport with scheduled passenger service is in Idaho Falls, Idaho. This airport, which is 90 miles west of the town of Jackson, annually handles about half as many scheduled passenger enplanements as the Jackson Hole Airport (Federal Aviation Administration 2009). In good weather, the drive to the Idaho Falls Regional Airport from Jackson requires more than 2 hours on primarily two-lane, mountain roads.

Alternatives

Two alternatives were evaluated. The evaluation period extended through 2033 when the airport either would close (the no action alternative) or would require additional action, such as another agreement extension, to maintain certification to provide scheduled passenger service.

Alternative 1: No Action/Continue Current Management. Regulations for implementing the National Environmental Policy Act require that the alternative of no action be included in all environmental evaluations. Accordingly, under Alternative 1, the no action alternative, the current agreement would stay in effect until 2033, and then expire.

Under this alternative, on April 27, 2013, the airport would lose its eligibility to federal funding for acquisition, repair, and replacement of airport infrastructure. Without federal funding, the Jackson Hole Airport Board would have difficulty maintaining the airport's federal certification to support scheduled passenger service. Without this certification, scheduled passenger service providers would have to terminate their service to the airport. This analysis assumed that loss of certification and associated scheduled passenger service would occur by 2015.

Between 2015 and 2033, the airport would continue operations under the existing agreement. General aviation would be the primary airport use, and pilots would rely on their own judgment regarding whether to continue to use the airport.

On April 27, 2033, the 1983 agreement would expire and the airport would close. Within six months, the Jackson Hole Airport Board would remove the terminal and restore its site to as nearly a natural condition as possible. After that date, the National Park Service would remove any remaining facilities and manage the airport site as a part of Grand Teton National Park.

Alternative 2: Preferred Alternative. Alternative 2 is the Jackson Hole Airport Board's proposal and the NPS' preferred alternative. The original proposal was to extend the 1983 agreement for two 10-year terms so that it would expire on April 27, 2053, with no other changes. In response to comments received on the draft environmental impact statement, Alternative 2 was revised to strengthen the commitment in the 1983 agreement to reduce the impacts of the airport to the lowest levels practicable.

The Environmentally Preferred Alternative. The environmentally preferred alternative is defined as "the alternative that will best promote the national environmental policy expressed in the National Environmental Policy Act's section 101." This generally is interpreted to mean the alternative that causes the least adverse effect on physical, biological, and cultural resources, but the policy also considers beneficial use of the nation's resources.

Alternative 1 would best promote the park's natural and cultural components. However, on a regional scale, Alternative 2 would better protect these resources by continuing the use of an existing facility rather than indirectly causing new construction outside the park for replacement facilities and supporting infrastructure. Alternative 2 also would be more effective in balancing resource use with the environment, because the social and economic benefits provided by the airport would continue without any additional degradation of natural and cultural resources in the park or the region.

Affected Environment

The existing environment in the vicinity of the Jackson Hole Airport is described, with emphasis on natural resources and visitor resources of Grand Teton National Park, park and airport operations, public health and safety, socioeconomics, and surface and air transportation. In conformance with Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act, the description of the affected environment is limited to resources in and outside Grand Teton National Park that potentially could be affected by implementing one or both alternatives

Environmental Consequences

Impact topics that were considered, and impacts associated with the alternatives are summarized in Table ES-1. Highlights of the findings are described below. No impairment or unacceptable impacts on park natural or cultural resources would occur.

Natural Soundscape. Both alternatives would continue the existing major, direct, long-term, adverse effects on the park's natural soundscape in 2015 and 2025. The effects would be most evident within a few miles of the airport, and would mostly affect areas in the south part of the park. With increasing distance from the airport and aircraft flight paths, aircraft sounds would diminish to the point of being a negligible impact. With Alternative 1, effects of the airport on the natural soundscape of the park would cease once the airport closed in 2033. With Alternative 2, the effects would continue at least until 2053. Both alternatives would continue to achieve compliance with the noise requirements in the 1983 agreement.

Visitor Use and Experience. Neither alternative would have major impacts on visitor use and experience.

Air Quality. Neither alternative would have major impacts on air quality based on evaluation factors that included emissions of criteria pollutants, Air Quality Index values, visibility, and deposition rates for nitrogen or sulfur

Visual Quality and Dark Skies. Neither alternative would have major impacts on the visual quality of Grand Teton National Park or the area's dark skies.

Water Quality and Hydrology. Neither alternative would have major impacts on water quality or hydrology.

Wildlife. Neither alternative would have major impacts on wildlife and their habitats, including special concern, threatened, and endangered species.

Park and Airport Operations. Under Alternative 1, long-term, direct, adverse impacts of major intensity on airport use and operations patterns would result from the loss of about 25% of the current average daily air traffic, all scheduled passenger service, and ground services other than those supporting general aviation. Alternative 2 would have negligible to moderate, long-term, direct impacts on aspects of airport operations.

Public Health and Safety. Neither alternative would have major impacts on public health and safety.

Socioeconomics. Alternative 1 would cause long-term, indirect, adverse impacts of major intensity for the town of Jackson and Teton County, Wyoming with regard to:

- Winter recreation outside the park;
- Economic impacts from on- and off-airport losses of jobs, purchases, and services;
- The end of locally available scheduled passenger service for area residents and businesses; and
- The loss of at least 90% of the airport's operating revenue and 70% of its funding for facility maintenance and capital improvements.

Alternative 2 would continue generating long-term socioeconomic benefits to the town of Jackson and Teton County, Wyoming.

Surface and Air Transportation. Alternative 1 would result in the following, long-term, direct and indirect impacts of major intensity on regional transportation systems from Jackson to Idaho Falls, and on Wyoming and Idaho transportation agencies.

- Impacts on visitors who arrive by air in the winter would be adverse.
- Changes in community access by air travel would be adverse.
- Impacts on levels of scheduled passenger air service would be adverse at the Jackson Hole Airport and beneficial at the Idaho Falls Regional Airport.
- Until 2033, growth in the air charter sector at the Jackson Hole Airport would be beneficial for general aviation. Closure of the airport in 2033 would have an adverse effect on general aviation.
- Increased automobile traffic between Jackson and Idaho Falls would be adverse regarding highway capacity in Wyoming and Idaho.

Alternative 2 would not have any major impacts on transportation.

TABLE ES-1: IMPACTS OF THE ALTERNATIVES

Impact Topic	Alternative 1: No Action / Continue Current Agreement	Alternative 2: Preferred Alternative
Natural soundscape	Alternative 1 would make the park quieter by decreasing the percent of the park in which sound from airport-related aircraft would be audible more than 10% of the time, from 24% of the park in 2005 to 20% of the park in both 2015 and 2025. However, because the thresholds involve comparisons to the natural soundscape, the airport would continue to have a major, direct, long-term, adverse impact. The southern part of the park, particularly areas within a few miles of the airport, would be most affected. With increasing distance from the airport and flight paths, aircraft sounds would diminish to the point of being a negligible impact. Maximum sound levels at most points in the park would be similar to those occurring in 2005. However, in 2015 and 2025, an additional 7% of the modeled points in the park would experience maximum sound levels greater than 60 dBA, compared to the baseline. The 15-hour energy-average sound level (Leq) which, because of the curfew, effectively represents the day-night average sound level (DNL), would be little changed compared to the baseline. The DNL would remain within the requirements stipulated in the 1983 agreement. Compared to the 2005 baseline, there would be little change in 2015 or 2025 regarding the percent of the time above 60 dBA at locations in the park, effects on the natural soundscape in the park's recommended wilderness, or sound impacts outside the park. When the airport closed in 2033, its effects on the natural soundscape of the park would cease. Sound levels outside the park north of Jackson would decrease. Areas around the airports that received increased use because of the air traffic that was displaced from the Jackson Hole Airport would experience increased noise impacts. No impairment would occur to the park's natural soundscape.	In both 2015 and 2025, aircraft using the Jackson Hole Airport would be audible more than 10% of the time in about 27% of the park. The effects on the natural soundscapes of Grand Teton National Park would be major, direct, long-term, and adverse. As with Alternative 1, effects would be most evident within a few miles of the airport, and would diminish with distance to the point of being negligible impacts. More points in the park would experience maximum sound levels in the range of 50 dBA to 70 dBA than under Alternative 1. The number of points exposed to maximum sound levels above 70 would not change. The 15-hour energy-average sound level (Leq) would extend slightly beyond the Alternative 1 contours, but the DNL would remain within the requirements stipulated in the 1983 agreement. Compared to Alternative 1, there would be little change in 2015 or 2025 regarding the percent of the time above 60 dBA at locations in the park. At points in the recommended wilderness boundary, impacts of Alternative 2 would be slightly higher. Outside the park, the Federal Aviation Administration's criterion for significance potentially could be met in an area immediately south of the airport boundary by 2025. Other areas under the flight path south of the airport might meet the marginal effects criteria. No impairment would occur to the park's natural soundscape.
Visitor use and experience	During the general aviation period from 2015 to 2033, non-natural sounds from scheduled passenger aircraft would be absent, resulting in direct, negligible to moderate, long-term, beneficial impacts. After the airport closed in 2033, all sounds associated with the Jackson Hole Airport would cease, resulting in direct, negligible to moderate, long-term, beneficial impacts on the experience of park visitors. The degree of impact would depend on individual visitor expectations as well as their location in the park relative to the airport.	Impacts would be long-term, direct, and adverse, and would range in intensity from negligible to moderate. The degree of impact would depend on individual visitor expectations as well as their location in the park relative to the airport.

TABLE ES-1: IMPACTS OF THE ALTERNATIVES (CONTINUED)

Impact Topic	Alternative 1: No Action / Continue Current Agreement	Alternative 2: Preferred Alternative
Air quality	In 2015 and 2025, emissions of air pollutants from the Jackson Hole Airport would be reduced relative to emissions in the modeled existing conditions baseline, which would have a long-term, direct, beneficial, impact on air quality. After 2033, closure of the airport would eliminate airport-related emissions and, thus, reduce the emissions profile of the park. This would have a direct, long-term, beneficial impact on air quality in Grand Teton National Park. Prior to 2033, cumulative impacts would be adverse and long-term for all modeled parameters because of the continued contribution of airport emissions. After 2033, impacts would change to negligible or beneficial.	Emissions would be greater, but for most parameters, the differences would be too small to measure in modeling, or to discern from the year-to-year meteorological variation. The intensity of impacts for these parameters would be negligible. Intensities that were greater than negligible were for tons-per-year emissions of the criteria pollutant carbon monoxide (adverse, direct, long-term, and minor) and deposition rates for nitrogen and sulfur (adverse, direct, long-term, and moderate). Emissions from implementing this alternative would be lower in both 2015 and 2025 than emissions currently occurring under the modeled existing conditions baseline. Therefore, on a relative basis, impacts from Alternative 2 would be greater than those that would occur with Alternative 1, and less than those associated with the current condition. Cumulatively, Alternative 2 would have adverse, long-term impacts because airport emissions would continue to contribute to the total emissions profile for the park.
Visual quality and dark skies	Until 2033, negligible effects would occur on the visibility of airport facilities and scenic integrity levels. Following airport closure, there would be long-term, beneficial, direct effects of minor or moderate intensity in foreground views from within the former development subzone and minor intensity in midground views looking west from observation points along U.S. Highway 26/89/191. Effects on scenic integrity levels of other views, including background views of the Teton Range, would be negligible. The direct, long-term, beneficial effect on the scenery and visibility of vistas from observation points along the highway because of aircraft in flight would be negligible after 2015, and minor after the airport was closed. Until 2033, effects on the visibility of dark skies would be negligible. Long-term, direct, beneficial effects would occur after the airport closed. The intensity of the change would be negligible to minor in the south part of the airport, minor to moderate in the north part of the airport, and moderate in the former development subzone area. Changes in the visibility of dark skies in the remainder of the park would be negligible. Negligible effects would occur on the cumulative changes in visual quality and the visibility of dark skies outside the park. No impairment would occur to the park's visual quality or dark skies.	A negligible effect on the visibility of airport facilities would occur. Increased air traffic would cause direct, adverse effects of minor intensity for some viewers at observation points along U.S. Highway 26/89/191 between the Teton Point Turnout and airport road intersection. Within the airport boundary, there would be negligible effects on the visibility of dark skies. Along the airport road and U.S. Highway 26/89/191 between the airport and Jackson, increased light emissions from headlights associated with increased airport-related traffic would have a direct, long-term, adverse effect of minor intensity during moonless, cloudless evenings, nights, and early mornings. At other times, impacts would be negligible. There would be negligible cumulative effects on the visibility of dark skies in Jackson or areas of Teton County outside the immediate vicinity of the airport. No impairment would occur to the park's visual quality or dark skies.

TABLE ES-1: IMPACTS OF THE ALTERNATIVES (CONTINUED)

Impact Topic	Alternative 1: No Action / Continue Current Agreement	Alternative 2: Preferred Alternative
Water quality and hydrology	There would be negligible effects on hydrology during the general aviation period and after airport closure. Negligible water quality impacts would occur with regard to National Pollutant Discharge Elimination System-permitted outfalls for storm water and septic tanks; fuel spills and/or leaks; glycol deicer use and disposal; aircraft and rental car maintenance operations; and discharges to the Enterprise Canal. No impairment would occur to the park's water quality or hydrology.	Impacts would be the same as those described for Alternative 1.
Wildlife and their habitats, including special concern, threatened, and endangered species	Until 2033, impacts would be negligible on general wildlife habitat availability and on habitat of migratory birds and species of concern. After 2033, when the airport perimeter fence was removed and developed areas were restored to native vegetation, there would be a negligible to minor, long-term, direct, beneficial impact on these wildlife habitats. Impacts on habitat of endangered or threatened species would be negligible, which equates to a "no effect" determination under section 7 of the Endangered Species Act. Prior to 2033, the adverse effects on greater sage-grouse that are associated with airport operations would continue, resulting in a negligible impact. After 2033, the end of airport-related disturbances and mortality, and the restoration of 128 acres of sagebrush habitat, would have a minor, long-term, direct, beneficial impact. Aircraft sound effects on wildlife would continue until 2033, which would be a negligible impact. Reduced sound exposure that would result from closure would have a minor, long-term, direct, beneficial effect on wildlife, with little consequence at the population level. Locally, wildlife mortality because of collisions with aircraft or vehicles on roads would decrease. However, a cumulative effect would be an increase in these types of incidents at other locations that had increased air and highway traffic because of flights that had been displaced from Jackson. The net effect on wildlife would be negligible. Implementation of Alternative 1 would have a negligible contribution to ongoing trends of wildlife habitat loss that are occurring because of development throughout the region. No impairment would occur to the park's wildlife; threatened, endangered, or special concern species, or their supporting habitats.	Until 2033, impacts would be negligible on general wildlife habitat availability and on habitat of migratory birds and species of concern. After 2033, impacts would be minor, long-term, direct, and adverse compared to Alternative 1 but negligible compared to current conditions. Impacts on habitat of endangered or threatened species would be negligible before and after 2033. This finding equates to an Endangered Species Act "no effect" determination. Habitat effects on greater sage-grouse would be minor, long-term, direct, and adverse both before and after 2033. Until 2033, aircraft sound effects would negligible. After that year, sound would have a minor, long-term, direct, adverse effect on wildlife, with little consequence at the population level. Effects of collisions between birds and aircraft would be negligible, except for sage-grouse. Impacts on this species would be long-term, direct, adverse, and of minor intensity Alternative 2 would result in higher mortality of wildlife on area highways, but cumulatively, the net effect would be negligible. Alternative 2 would have a negligible contribution to ongoing trends of region-wide wildlife habitat loss. No impairment would occur to the park's wildlife; threatened, endangered, or special concern species, or their supporting habitats.

TABLE ES-1: IMPACTS OF THE ALTERNATIVES (CONTINUED)

Impact Topic	Alternative 1: No Action / Continue Current Agreement	Alternative 2: Preferred Alternative
Park and airport operations	For the National Park Service, effects would be negligible on the operation of the park, planning for transit, ensuring cooperation with the Jackson Hole Airport Board, and the amount of payments to the U.S. Department of the Interior. Negligible to minor, adverse, short-term effects would result to interagency helibase operations. For the airport during the transition and general aviation periods, impacts on facilities in the development subzone would be long-term, direct, adverse, and of moderate intensity. Negligible impacts would occur on development of facilities outside the development subzone. Beginning in 2015, major, long-term, direct, adverse impacts on use and operations patterns would result from the loss of about 25% of the current air traffic levels, all scheduled passenger service, and ground services other than those supporting general aviation. Following airport closure, the impacts on airport facilities, use and operations patterns, and capacity would be direct, long-term, adverse, and of major intensity.	For the National Park Service, the effects of Alternative 2 on the operation of Grand Teton National Park would be long-term, minor, and adverse as a result of the ongoing need to commit park resources to address operation of the airport. Impacts on interagency helibase operations would be negligible to minor. Effects regarding airport facilities and infrastructure would be long-term, direct, moderate, and beneficial. This alternative would continue the airport's eligibility for Federal Aviation Administration grants, which would enable the Jackson Hole Airport Board to continue to operate, maintain, and upgrade the runway, taxiway, passenger terminal, safety equipment, roads and parking, and all other facilities that enable the airport to support scheduled passenger and general aviation. The effects of Alternative 2 on airport operations and use patterns would be long-term, direct, beneficial, and negligible to minor. This includes impacts to numbers of operations and passenger enplanements, operational profile with regarding the mix of scheduled passenger and general aviation operations, and aircraft sizes in the fleet mix that uses the airport.
Public health and safety	During the general aviation period, long-term, direct, adverse effects on safety of moderate intensity would result from the inability of the airport to install upgraded navigational aids; purchase snowplows, fire trucks, and other major pieces of safety equipment; and maintain rescue training at current levels. Minor, long-term, direct, adverse effects would result from reduced maintenance of the runway and taxiway and reduced availability of medical evacuations for non-critical conditions. Life- or health-critical medical evacuations would experience negligible effects, but visiting physician services could experience long-term, direct, adverse impacts of minor intensity. Regionally, there would be a negligible effect on the number of aircraft accidents. Decreases in automobile traffic between the airport and Jackson would have a beneficial, long-term, indirect impact of moderate intensity on highway safety. Increases in traffic on roads between Jackson and the Idaho Falls Regional Airport would have an adverse, long-term, indirect impact of moderate intensity. Negligible effects would occur with regard to flight operations that provide vital safety links; emergency response services, such as search and rescue and wildland fire fighting; and the handling of hazardous materials.	Direct, long-term, beneficial effects of minor intensity would result from the ability to pay for upgraded navigational aids, safety equipment and training, and refurbishing of infrastructure such as the runway and taxiway. All other impacts would be negligible.

TABLE ES-1: IMPACTS OF THE ALTERNATIVES (CONTINUED)

Impact Topic	Alternative 1: No Action / Continue Current Agreement	Alternative 2: Preferred Alternative
Socio-economics	Major, long-term, indirect, adverse impacts would occur for the town of Jackson and Teton County, Wyoming. Adverse impacts would also occur in Lincoln County, Wyoming, and Teton County, Idaho. Contributing components would include the following. For recreation outside the park, the intensity would be minor in the summer and major in the winter. The economic impact from on-airport losses of jobs, purchases, and services would be major. The off-airport losses of jobs, purchases, and services would have major impacts. The end of locally available scheduled passenger service would have moderate to major impacts on most local residents and businesses. The loss of more than 90% of the airport's operating revenue and 70% of its funding for facility maintenance and capital improvements would have major adverse economic impacts on the airport. Effects on quality of life would depend on personal perceptions.	This alternative would maintain the area's existing economic and socioeconomic trends, which would result in long-term, direct and indirect, negligible or minor impacts.
Surface and air transportation	Adverse, direct, long-term impacts on visitors who arrive by air would be minor in the summer and major in the winter. Changes in community access by air travel would have major, direct, long-term, adverse effects on residents and the business community in and around Jackson. Impacts on levels of scheduled passenger air service at the Jackson Hole Airport would be major, direct, long-term, and adverse. Major, indirect, long-term, beneficial effects would occur at the Idaho Falls Regional Airport. Until 2033, growth in the air charter sector would have a direct, major, long-term, beneficial effect on general aviation. Closure of the airport would be a major, direct, long-term, adverse effect on all general aviation sectors. Other airports in the region would experience similar gains in general aviation, a major beneficial effect. Long-term, direct highway traffic effects would be moderate and beneficial between the airport and Jackson, and major and adverse between Jackson and the alternate site of air service, Idaho Falls. Highway planning in Wyoming and Idaho also would experience major, adverse, indirect, long-term effects. Improved opportunities to promote public transit would have direct, negligible to moderate, long-term, effects that would be both beneficial and adverse.	Negligible effects would occur because it essentially would maintain the status quo with regard to use of the airport. Current trends with regard to air transportation, use of roads and highways both within and outside the park, and other transportation-related activities such as planning would continue.

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Chapter 1
Purpose and Need for Action

PURPOSE AND NEED

PURPOSE

The Jackson Hole Airport is within Grand Teton National Park and operates under the terms and conditions of a 1983 agreement between the Jackson Hole Airport Board and the United States (U.S.) Department of the Interior. Within the Department of the Interior, the National Park Service (NPS) administers the agreement.

The agreement was signed on April 27, 1983. The term of the agreement is for 30 years, with two additional 10-year options, both of which have been exercised. As a result, the current agreement authorizes operation of the airport until April 27, 2033. Section 1(b) of the agreement allows the parties to further extend the term of the agreement based on mutually satisfactory terms.

On April 25, 2005, the Jackson Hole Airport Board sent a formal request for an amendment to the 1983 agreement to the superintendent of Grand Teton National Park. A copy of the letter request is provided in Appendix A. The purpose of the amendment would be to extend the term of the agreement by 20 years, until April 27, 2053. This would enable the Jackson Hole Airport Board to maintain "satisfactory property interests" in the lands under the airport. Demonstrating such interests would allow the airport to remain eligible for funding from the Federal Aviation Administration. Otherwise, the airport would lose its funding eligibility after April 27, 2013 and would have difficulty maintaining the certification that allows it to support scheduled, passenger-carrying operations.

In response to the request from the Jackson Hole Airport Board, the National Park Service began preparing an environmental assessment regarding the proposed extension of the agreement's term. Subsequently, the National Park Service determined that its planning process would be better served, and the quality of its decision would be enhanced, by preparation of an environmental impact statement rather than an environmental assessment. The notice of intent to prepare an environmental impact statement was published in the Federal Register on August 9, 2007. The notice of availability of the draft environmental impact statement was published on April 3, 2009 and the document was available for public review until June 15, 2009.

The purpose of this environmental impact statement is to evaluate the Jackson Hole Airport Board's proposal to amend the 1983 agreement by extending the authorized term by 20 years (two 10-year terms). This document provides compliance with the National Environmental Policy Act of 1969; regulations from the Council on Environmental Quality (1978) for implementing the procedural provisions of the National Environmental Policy Act; and other associated laws and regulations, including laws and policies that are specific to the National Park Service.

NEED FOR FEDERAL FUNDING ELIGIBILITY FOR THE JACKSON HOLE AIRPORT

The Federal Aviation Administration regulations published in Title 14, Part 152 of the *Code of Federal Regulations* require that an airport that does not own its land must have more than 20 years remaining on its lease or agreement to be eligible for Airport Improvement Program funds. Therefore, for the Jackson Hole Airport to remain eligible for federal funding, the airport agreement must be extended by no later than April 27, 2013. A 20-year extension would allow the airport to maintain federal funding eligibility until 2033 and operate until 2053. Without an extension of the term, the airport agreement would expire in 2033 and the Jackson Hole Airport would be closed.

Between 1997 and 2009, almost $44 million in projects were funded at the Jackson Hole Airport by the Federal Aviation Administration. The amount of funding received per year was highly variable, ranging from less than $500,000 in fiscal year 1998/1999 to more than $6 million in fiscal year 1999/2000. Major improvements that were financed by these grants included apron expansion; construction of runway safety zones; including security enhancements in response to the terrorist attacks of September 11, 2001; construction of the air traffic control tower; acquisition of snowplows and fire trucks; and installation of airport fencing. Taxiway rehabilitation funded by this source was completed in 2008. Almost a third of the nearly $30 million 2009/2010 terminal expansion was provided by Federal Aviation Administration funds.

The airport's current capital improvement plan includes the following construction and rehabilitation projects that are eligible for Federal Aviation Administration grant funding:

- Safety planning study;
- Glycol recapture system; and
- Sound monitoring system upgrades.

Without federal grant funding, the airport would not have adequate operating and non-operating revenues to fund these projects. Similar funding shortfalls would occur throughout the life of the airport.

BACKGROUND

AREA DESCRIPTION

The Jackson Hole Airport is located on 533 acres within Grand Teton National Park. The park, which was established in 1929, encompasses more than 310,000 acres of spectacular scenery that includes majestic mountain and surrounding lakes, rivers, forests, and sagebrush flats. Its visitation ranks among the top 10% in the national park system and it annually hosts about 2.4 million recreational visitors (NPS 2005a).

The park provides visitors with an opportunity to experience two linked but distinct settings. The backcountry areas of the park occupy a vertical landscape of towering peaks and deep, glaciated valleys. This mountainous portion of the park is largely roadless, with an extensive system of trails for hikers and horse users. The valley floor includes numerous lakes, the Snake River, and important scenic, cultural, and wildlife resources. The frontcountry areas of the park are located in the valley and include about 140 miles of paved roads and 70 miles of unpaved roads, five major developed areas and several lesser development zones covering approximately 2,300 acres, 950 acres of private inholdings, five major campgrounds, and large administrative areas at Moose, Beaver Creek, Colter Bay, and Moran.

North of Grand Teton National Park is the John D. Rockefeller, Jr. Memorial Parkway, which is administered by the superintendent of Grand Teton National Park, and to its north is Yellowstone National Park. These national park units and the area's national forests all are a part of the greater Yellowstone ecosystem.

The Bridger-Teton National Forest is adjacent to Grand Teton National Park on the east and south, and the Caribou-Targhee National Forest adjoins the park on the west. The national forests provide dispersed recreation opportunities year-round, and several developed winter ski resorts are on national forest lands near the park. These include the Snow King Resort, Jackson Hole Mountain Resort, and Grand Targhee Resort in Teton County, which collectively provide 550,000 to 600,000 skier days of recreation each winter. Approximately 90% are non-local skiers who make major contributions to the local economy when they purchase food, lodging, and other goods and services. An estimated 90% of the non-local winter visitors arrive in the area through the Jackson Hole Airport (RRC Associates 2005).

The town of Jackson, which was first settled in the 1880s, is the county's primary government, commercial, and residential center. Transitory use of the area by people of European descent began when the topographic feature known as "Jackson's Hole" served as a crossroad for several trapper trails from the 1820s until the 1840s. However, permanent settlement did not occur until more than four decades later. Agriculture predominated until the middle of the 20th century, but the economies of the town of Jackson and Teton County are now strongly based on tourism. These primarily include summer visitation to Grand Teton National Park, Yellowstone National Park, and other federal lands; and winter use of ski resorts and other recreation opportunities on federal lands.

ESTABLISHMENT OF THE JACKSON HOLE AIRPORT

The Jackson Hole Airport was created by the town of Jackson at its present location in the 1930s, before the site was part of Grand Teton National Park. At first, it consisted of an unpaved landing strip.

By 1939, parts of the site were leased from the Bureau of Land Management, State of Wyoming, Jackson Hole Preserve, Inc., and private landowners.

Beginning in 1941, scheduled passenger air service using DC-3 propeller aircraft was provided at the Jackson Hole Airport. A log terminal building was constructed to provide passenger services (Jackson Hole Airport 2006a).

In 1943, a large portion of the Jackson Hole valley, including the airport site, was designated as Jackson Hole National Monument by presidential proclamation. In 1950, the Jackson Hole Monument was merged into adjacent Grand Teton National Park, which had been established in 1929. As a result of the merger, the airport site was incorporated into the national park. Figure 1 shows the location of the airport within Grand Teton National Park.

On March 18, 1950, Congress passed the Department of the Interior Airports Act. The full text of this act's provisions, from the current version of the United States Code, Title 16, Chapter 1, Subchapter I, sections 7a-7e, is provided in Appendix B. Under this act,

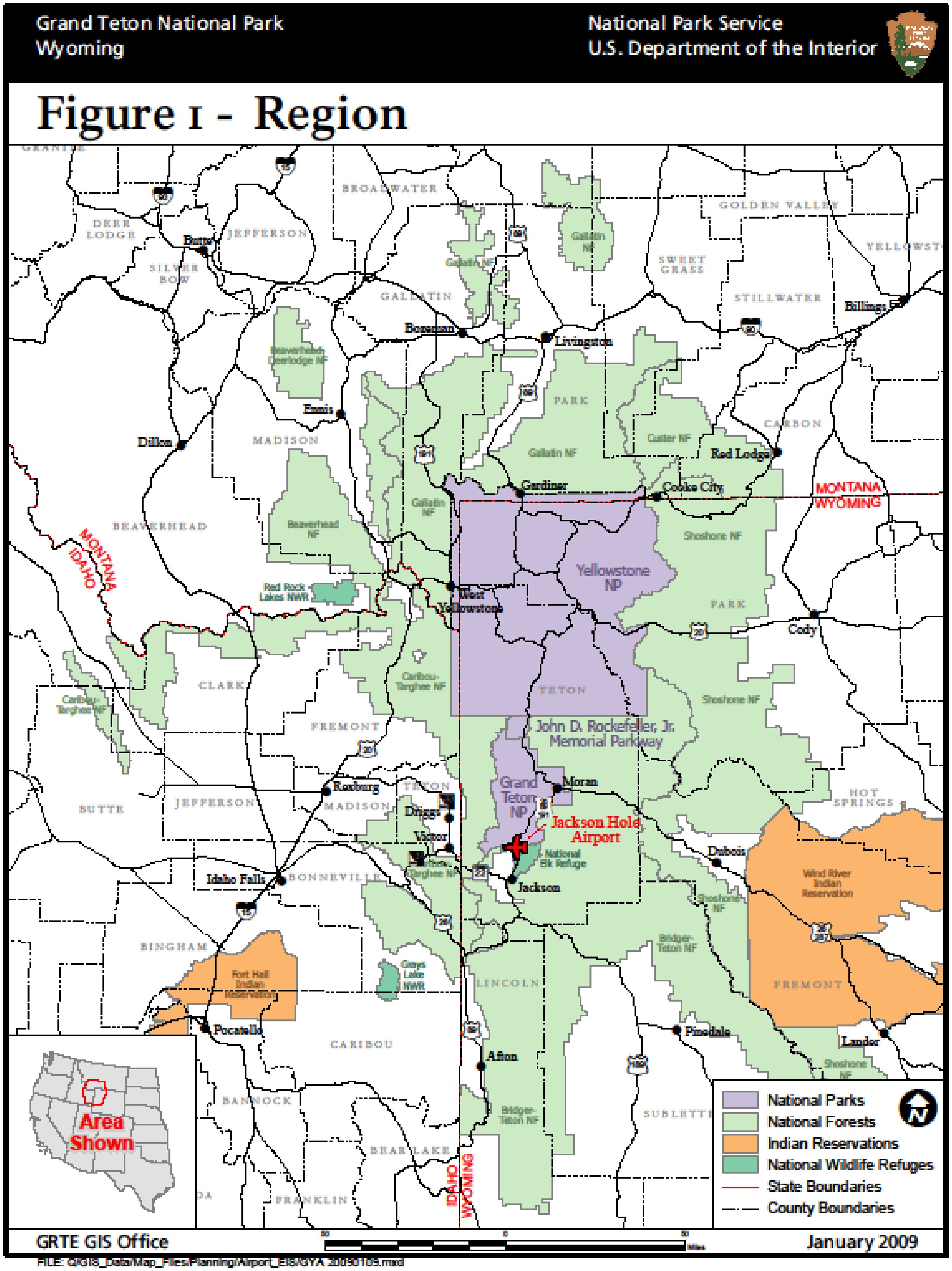
> *The Secretary of the Interior (hereinafter called the "Secretary") is authorized to plan, acquire, establish, construct, enlarge, improve, maintain, equip, operate, regulate, and protect airports in the continental United States in, or in close proximity to, national parks, national monuments, and national recreation areas, when such airports are determined by him to be necessary to the proper performance of the functions of the Department of the Interior.*

In April 1955, the Secretary of the Interior granted the Town of Jackson and Teton County a 20-year permit to operate the Jackson Hole Airport within Grand Teton National Park. In 1967, the Town of Jackson and Teton County created the Jackson Hole Airport Board (a joint powers board) to operate the airport. Jackson Hole Airport is the only airport in a unit of the national park system that provides scheduled commercial air carrier service. The Provincetown Municipal Airport in Cape Cod National Seashore serves general aviation and provides commuter service to Boston's Logan International Airport.

PERMITS AND AGREEMENTS AUTHORIZING THE JACKSON HOLE AIRPORT

Prior to 1983, the Jackson Hole Airport was authorized through a series of special use permits from the National Park Service, as follows:

- In 1955, a permit was issued allowing the airport to operate in the park for 20 years.
- In 1969, the National Park Service provided a renewal clause in the permit.
- Another permit was issued on August 1, 1979. This permit reduced the land area of the airport from 760 acres to 533 acres, but reconfigured the airport boundary so that a northerly runway extension to 8,000 feet could be accommodated. The 1979 permit also called for the Jackson Hole Airport Board to develop a voluntary noise abatement plan to route aircraft away from noise-sensitive areas of Grand Teton National Park.


Grand Teton National Park
Wyoming
National Park Service
U.S. Department of the Interior
Figure 1 - Region
Yellowstone NP
John D. Rockefeller, Jr. Memorial Parkway
Grand Teton NP
Jackson Hole Airport
National Elk Refuge
MONTANA
WYOMING
MONTANA
IDAHO
IDAHO
WYOMING
Bozeman
Livingston
Billings
Butte
Dillon
Ennis
Gardiner
Cooke City
Red Lodge
West Yellowstone
Cody
Moran
Jackson
Dubois
Rexburg
Driggs
Victor
Idaho Falls
Pocatello
Afton
Pinedale
Lander
Gallatin NF
Beaverhead Deerlodge NF
Beaverhead NF
Custer NF
Shoshone NF
Caribou-Targhee NF
Bridger-Teton NF
Red Rock Lakes NWR
Grays Lake NWR
Wind River Indian Reservation
Fort Hall Indian Reservation
Area Shown
National Parks
National Forests
Indian Reservations
National Wildlife Refuges
State Boundaries
County Boundaries
GRTE GIS Office
January 2009
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Throughout the 1970s, the presence of the Jackson Hole Airport in the park was the subject of controversy, both in a general sense relating to impacts on the park, and over proposals to extend the length of the runway. In 1979, Acting Secretary of the Interior James Joseph determined that the airport's existing special use permit should not be renewed when it expired in 1995. In 1983, Secretary of the Interior James Watt reversed that decision and entered into the current agreement with the Jackson Hole Airport Board.

The 1979 permit was not scheduled to expire until April 1995. However, to be eligible to receive Federal Aviation Administration funding, the Jackson Hole Airport Board had to meet the requirements of Title 14, Part 152 of the *Code of Federal Regulations* and demonstrate that the land on which the airport was built was committed to this use for at least the next 20 years. Therefore, a new agreement between the Jackson Hole Airport Board and the Secretary of the Interior was signed less than four years later, on April 27, 1983. In the opening paragraph, the agreement states:

> *It is, therefore, the desire of the parties that this agreement be executed to extend the term of the present permit to provide a mechanism to facilitate the qualification for Federal Aviation Administration grants-in-aid and for appropriate amortization of improvement costs, to make necessary changes in the terms thereof, and so set forth more precisely the mutual obligations and responsibilities of the parties.*

An extension of the April 27, 1983 agreement is the subject of this environmental impact statement.

The full text of the 1983 agreement is provided in Appendix C. Key provisions related to the proposed action to extend the term of the 1983 agreement include the following:

- **Term (section 1).** The primary term of the agreement was for 30 years, with two 10-year renewal options that could be exercised at the end of the 10th year of the 30-year term and at the end of each 10-year period after that. The agreement was limited in length, including extensions, to 50 years, but stated that further extensions, amendments, or modifications could be negotiated by the parties on mutually satisfactory terms.

  The 10-year options were exercised by the Jackson Hole Airport Board in 1993 and 2003. Each of these actions ensured that the remaining term of the agreement was between 20 and 30 years so that the airport would continue to meet the 20-year "satisfactory property interests" requirements of Title 14, Part 152 of the *Code of Federal Regulations*. If no action is taken by April 27, 2013 to extend the term of the agreement, less than 20 years will remain on the term and the airport will no longer be eligible for Federal Aviation Administration funding.

- **Land (section 2).** The agreement defines the boundaries of the airport, which is limited to a 533-acre site, plus an additional 4.37 acres for the access road. The airport cannot be expanded beyond this area.

- **Noise Control (section 4).** The agreement includes a number of provisions relating to noise control to mitigate the effects of the airport on the park. The single-event and cumulative noise requirements represent enforceable upper bounds on the allowable noise exposure. Failure of the Board to meet these requirements would be a material breach of the agreement.

  Section 4(e) required the Jackson Hole Airport Board to complete a revised noise abatement plan "to ensure that future airport operations are controlled in such manner that aircraft noise exposure will remain compatible with the purposes of Grand Teton National Park and will result in no significant increase in cumulative or single event noise impacts on noise sensitive areas of the Park." The environmental assessment that provided National Environmental Policy Act compliance for the 1983 agreement specified that "no significant increase" had the meaning as defined in Federal Aviation Administration Order 5050.4. By prohibiting the 55-decibel DNL contour from extending into the noise-sensitive areas of the park, the agreement effectively ensured that no significant increase in cumulative noise impacts could occur, relative to the Order 5050.4 standard, because significant increases are tied to increases in noise on noise-sensitive areas within the 65-decibel DNL contour.

The revised noise abatement plan that was prepared in response to section 4(e) has been in place since 1985. It is included in Appendix D of this final environmental impact statement. The plan was approved by the Federal Aviation Administration in accordance with Part 150 of the Federal Aviation Regulations, and includes measures that the Board has implemented to comply with the terms of the 1983 agreement. The noise abatement plan include the:

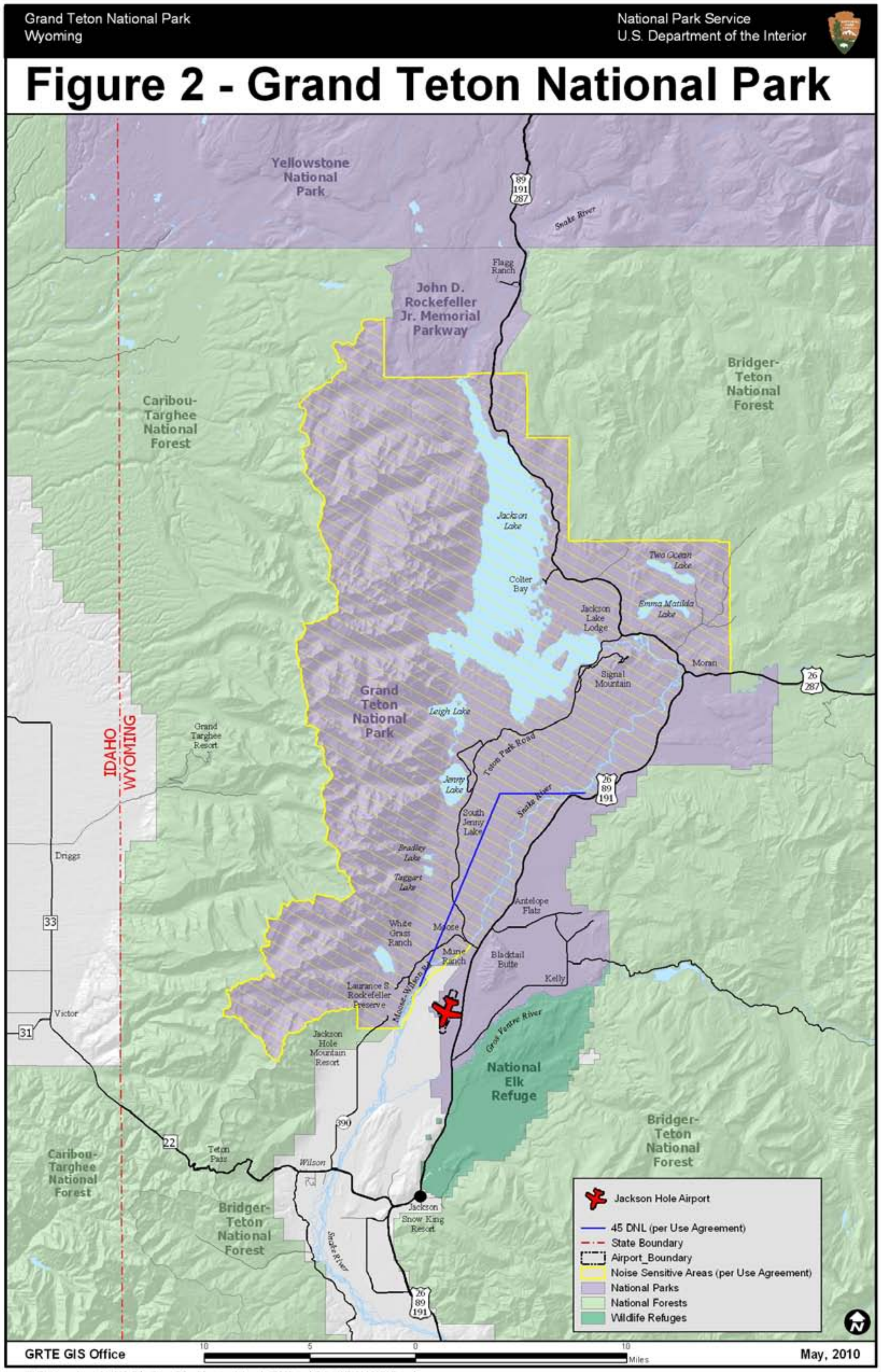
- Measurement and enforcement methods for compliance with the single-event noise limit;
- Standard for cumulative noise exposure and an access plan to ensure that the limits will not be violated. The access plan limits the number of commercial annual average daily departures to no more than 6.5, based on the Boeing 737-200. Quieter aircraft may operate in greater numbers based on a noise-equivalency formula.
- Noise monitoring plan.
- Aircraft operational procedures, such as requesting aircraft operators to land on runway 36 (now 01) and takeoff on runway 18 (now 19) whenever possible.

Section 4(e) also includes a requirement that, on a continuous basis, the noise abatement plan must be reviewed and updated "to incorporate new prudent and feasible technological advances which would allow further reduction in noise impacts on Grand Teton National Park." A discussion regarding the effectiveness of the noise abatement plan, including the incorporation of new technologies and a comparison with the conditions that existed in the early 1980s, is provided in Chapter 3.

Section 4(f) establishes a cumulative noise standard based on day-night average sound level (DNL). This metric is an energy-average sound level, including a nighttime penalty, which represents the total sound exposure over a 24-hour period. The agreement establishes a restriction line beyond which the 45-decibel DNL contour must not extend, and further specifies that the 55-decibel DNL contour may not extend into noise-sensitive areas of the park as mapped in the agreement. These areas are shown in Figure 2, the Grand Teton National Park map.

(The Federal Aviation Administration considers all land uses to be compatible with noise levels less than a DNL of 65 decibels. No other airport in the United States is believed to have a requirement regarding cumulative noise exposure that is as strict as the requirement in the 1983 agreement.)

Section 4(g) prohibits the operation of any aircraft having a certified single-event noise level on approach, as defined by Federal Aviation Administration Circular 36-3B or the version of that document currently in effect, that exceeds 92 A-weighted decibels (dBA). (The current version is Circular 36-3H, dated April 25, 2002.)



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Improvements (section 7(a)). Within the 533-acre airport boundary, the agreement specifies a development subzone, approximately 28.5 acres in size, in which improvements that are necessary and desirable for the operation of the airport can be constructed. This area contains the terminal, hangars, parking, rental car companies, and other support facilities. Buildings in the development subzone are restricted in height to the elevation of the highest structures that were present in 1983.

The Board may reconfigure development within the subzone, but may not expand the size of the subzone. For example, the Board is currently expanding and remodeling the terminal, but all of the expansion is within the subzone in an area previously used for parking.

The remainder of the airport is used for the airfield. It includes the runway, taxiway, navigational aids, service roads, air traffic control tower, and other infrastructure necessary to support aircraft operations.

- **Runway (section 7(b)).** The agreement maintains the length of the runway as it existed in 1983, which was at 6,305 feet. Although a number of proposals to lengthen the runway were made in the years before the 1983 agreement, the issue was highly controversial and the parties chose not to address extension of the runway in the agreement. Rather, the agreement states that extension of the runway can only be accomplished by amendment to the agreement. Any future proposal to extend the length of the runway would require compliance with the National Environmental Policy Act, which likely would involve preparing an environmental impact statement and record of decision. A runway extension proposal also would require the concurrence of the U.S. Department of the Interior and Jackson Hole Airport Board. The length of the runway cannot be extended by the unilateral action of either party to the agreement or by any other entity.

The 1983 agreement was supported by an environmental assessment and finding of no significant impact that were prepared by the National Park Service (1983). The environmental assessment was based on conditions that existed at that time, or were reasonably foreseeable.

The agreement has been amended twice since 1983. The amendments, which are included in Appendix C, would remain part of the 1983 agreement under the proposed action. Appropriate National Environmental Policy Act compliance documentation was completed for each amendment.

- The amendment dated July 29, 1985 clarified the timetable for preparation, Federal Aviation Administration approval, implementation of the revised noise abatement plan, and the amount of time that the Jackson Hole Airport Board would be granted to cure any default of the agreement.
- The amendment dated July 30, 2003 allowed the National Park Service to construct and operate an interagency helibase at the airport. The helibase is used by the National Park Service and U.S. Forest Service primarily for wildland firefighting and for search and rescue operations.

AIRCRAFT SOUND AND THE JACKSON HOLE AIRPORT

Federal Aviation Administration Sound Impact Levels for All Airports and Aircraft Operations

The Federal Aviation Administration standards and methods governing airport sound compatibility programs are included in Title 14, *Code of Federal Regulations,* Part 150, Airport Noise Compatibility Planning. This regulation identifies land uses that normally are compatible with various levels of exposure to sound. Section A150.101(d) states that, “For the purpose of compliance with this part, all land uses are considered to be compatible with noise levels less than Ldn [a day-night average sound level of] 65 dB."

Based on criteria in Federal Aviation Administration (2006e) Order 1050.1E, a significant sound impact would occur if an action alternative caused areas that may be sensitive to noise to experience an increase in the day-night average sound level (DNL) of 1.5 A-weighted decibels (dBA) or more, at or above a DNL of 65 dBA exposure when compared to the no action alternative for the same timeframe. The areas that may be sensitive to noise include "residential, educational, health, and religious structures and sites; and parks, recreational areas (including areas with wilderness characteristics), wildlife refuges, and cultural and historical sites."

The Federal Aviation Administration recognizes that "Special consideration needs to be given to the evaluation of the significance of noise impacts on noise sensitive areas within national parks. . . . For example, the DNL 65 dB threshold does not adequately address the effects of noise on visitors to areas within a national park or national wildlife refuge where other noise is very low and a quiet setting is a generally recognized purpose and attribute" (Federal Aviation Administration 2006e). Although the Federal Aviation Administration has not promulgated any regulatory standards to define sound levels that are compatible with these areas, it has identified marginal levels of impact at day-night average sound levels between 45 dBA and 65 dBA, as shown in Table 1.

TABLE 1: FEDERAL AVIATION ADMINISTRATION CRITERIA FOR DETERMINING IMPACTS OF INCREASES IN AIRCRAFT SOUND [a/]

Original Sound Exposure in Day-Night Average Sound Level in dBA	Increase in Day-Night Average Sound Level in dBA	Level of Impact	Source
45 to 60	5.0 or more	Marginal	Notice N 7210.360 (Federal Aviation Administration 1990).
60 to 65	3.0 or more	Marginal	Federal Interagency Committee on Noise (1992).
65 or above	1.5 or more	Significant	Order 1050.1E (Federal Aviation Administration 2006e) and 14 *Code of Federal Regulations* Part 150, section 150.21(2)(d).

a/ Source: Federal Aviation Administration 2006b.

Federal Aviation Administration (2006e) Order 1050.1E, *Environmental Impacts: Policies and Procedures*, provides guidance for considering the effects of sound from airports and airway traffic routes. Actions higher than 3,000 feet above ground level (AGL) are normally considered environmentally "categorically excluded" and no further action is required. However, experience demonstrated that some actions above this height can be controversial. As a result, the Federal Aviation Administration (1990) developed Notice N 7210.360, *Noise Screening Procedure for Certain Air Traffic Actions above 3,000 Feet AGL*. Based on implementing this notice, an increase in the day-night average sound level of 5 dBA evolved as the benchmark for indicating "an extraordinary circumstance" and prompting the preparation of an environmental assessment (Federal Aviation Administration 2006b).

In the National Parks Air Tour Management Act of 2000, Congress recognized that the natural soundscapes of national parks required additional protection. Therefore, it made a finding that the Federal Aviation Administration must work with the National Park Service "to preserve, protect, and enhance the environment by minimizing, mitigating, or preventing the adverse effects of aircraft overflights on public and tribal lands."

The Federal Aviation Administration criteria shown in Table 1 are not directly applicable to this evaluation of Grand Teton National Park. Instead, this environmental impact statement evaluates the impacts of the NPS action (extending the 1983 agreement for two more 10-year terms) on park resources based on the more stringent noise standards in the 1983 agreement and on impact criteria presented in this environmental impact statement. However, this evaluation does consider the Federal Aviation Administration criteria for areas outside the park, and identifies areas that might be characterized as experiencing marginal or significant levels of impacts if this were a Federal Aviation Administration action.

The Federal Aviation Administration criteria in Table 1 apply to *increases* in aircraft sound that result from federal actions. However, they also provide useful guidance for evaluating the *decreases* in sound levels outside the park that could be associated with Jackson Hole Airport agreement extension alternatives.

Additional Noise Abatement and Mitigation Requirements for the Jackson Hole Airport

Based on the 1983 agreement, the Jackson Hole Airport has more restrictive sound management requirements than the 65-dBA day-night average sound level used by the Federal Aviation Administration, including what may be the most restrictive sound management limits of any airport in the nation. The agreement includes designated cumulative and single-event noise standards. The agreement states, "Failure to enforce these noise standards shall be a material breach of the agreement."

Under the cumulative noise standard requirements:

- "Acoustical energy associated with airport operations shall not exceed a level of 45 db (Ldn [day-night average sound level, also abbreviated as DNL]), based on measurement of single event noise levels" west or north of a line specified in the agreement (section 4(f)(1)). This line is included on Figure 2.
- "Airport operations will not generate a 55 Ldn noise contour which extends beyond the boundary of the noise sensitive areas of the park as set forth in Attachments C and D, which has been established based on the environmental resource needs of the park" (section 4(f)(2)). Attachments C and D are presented on pages 457 and 458 in this final environmental impact statement. The specified area also is included on Figure 2.

In the 1983 agreement, the single-event noise standard for aircraft on approach to Jackson Hole Airport was established at 92 dBA (section 4(g)). This requirement applies to the Federal Aviation Administration Circular 36 certification status of each aircraft type determined under controlled conditions. It is not a threshold value to be applied against modeled or monitored sounds levels of airport operations.

Actions Taken by the Jackson Hole Airport Board to Reduce Airport-Related Sound

The Jackson Hole Airport Board has implemented numerous actions to ensure that aircraft sound is below the 1983 agreement cumulative and single-event requirements. These include, but are not limited to, the following.

Noise Abatement Plan. The Jackson Hole Airport Board's noise abatement plan is provided in Appendix D. The noise abatement plan was adopted on March 14, 1985 and has been in effect since that date. Major sections of the plan include maximum noise level limit, cumulative noise standard, aircraft operating procedures, operations specifications amendment for scheduled passenger service airlines, requirements for aeronautical contractors, noise complaint/inquiry report system, and educational efforts.

Ensuring Effectiveness of the Noise Abatement Plan. Before the U.S. Department of the Interior entered into the 1983 agreement with the Jackson Hole Airport Board, the National Park Service prepared an environmental assessment regarding the proposed renegotiation of the permit that was then in effect (NPS 1983). Three alternatives were evaluated, including modifications to the permit. The noise control analysis stated:

> *To assure that the objective of the proposed Noise Abatement Plan is achieved, it may be appropriate for the Department to establish a performance standard. The management agreement could require the Board, in cooperation with FAA and others, to implement and enforce such noise abatement measures as are necessary to assure that there will be no significant increase (as defined in FAA Order 5050.4) in cumulative or single event noise impacts on noise sensitive areas of Grand Teton National Park. These standards might be accomplished by banning noisier aircraft, air traffic control and other measures such as climb gradients.*

After concluding the National Environmental Policy Act process with a finding of no significant impact, the U.S. Department of the Interior executed the current agreement with the Jackson Hole Airport Board on April 27, 1983, based on the environmental assessment's Alternative 3, "Possible Modifications to Board Proposal and/or Present Permit." The 1983 agreement modified the Jackson Hole Airport Board's original proposal as follows:

- Section 4(e) Noise Control Plan, was modified to clarify that the revised noise control plan was to be based on Part 150 of the Federal Aviation Regulations. Additionally, language was taken from the environmental assessment to clarify that the objective of a revised noise control plan was to ensure that there would be "no significant increase in cumulative or single event noise impacts on noise sensitive areas of the Park."
- The agreement was revised to include performance standards that, if met, would ensure that there would be no significant increase in cumulative or single-event noise impacts on noise-sensitive areas of the park. New section 4(f) addressed cumulative noise impacts by specifying that the 45-decibel day-night average sound level (DNL) contour could not extend beyond a defined restriction line in the noise-sensitive areas of the park, and that the 55-decibel DNL contour could not extend into the noise-sensitive areas at all. Failure by the Jackson Hole Airport Board to enforce these standards was made to be a material breach of the agreement. The agreement's restrictions regarding the 55-decibel DNL contour effectively ensured that no significant increase in cumulative noise impacts could occur, because significant increases (within the meaning of the term as described in the environmental assessment) are tied to increases in noise on noise-sensitive areas within the 65-decibel DNL contour.

  New section 4(g) established a performance metric for single-event noise. No aircraft would be allowed to operate at the Jackson Hole Airport if it had a single-event noise level exceeding 92 dBA on approach, as determined by Federal Aviation Administration Circular 36-3B or the version of that document currently in effect.

- A new section 4(h) was added to prohibit the origination from the airport of scenic, charter, and training flights over noise-sensitive areas of the park.

To ensure compliance with the restrictions in the agreement, the Jackson Hole Airport Board has been conducting semi-annual noise measurement surveys since 1984 and has been modeling airport noise with the Federal Aviation Administration's Integrated Noise Model (INM). Reports on the results have been provided to the National Park Service each year, and have shown that the Board consistently has met the requirements of the agreement. Copies of the most recent reports are available on the Internet at <www.nps.gov/grte/parkmgmt/planning.htm>.

The 2008 annual noise report, (Jackson Hole Airport Board 2009) provides a comprehensive analysis of the airport's operational profile and associated noise impacts. The report was based on both actual measurements and modeling using the latest available versions of the Integrated Noise Model. The report shows that:

- The annual DNL at Moose was 51 dBA, compared to 48 dBA in 1984. None of the intervening years reached the 55-decibel DNL specified in the agreement.
- At the Barker site, located along the 45-decibel DNL restriction line, the annual noise level was 34 dBA, compared to approximately 42 dBA in 1984. None of the intervening years reached the 45-decibel DNL limit specified in the agreement.

A side-by-side presentation of the noise contours in 1984 and 2008 is included in Chapter 3 of this environmental impact statement.

The cumulative and single-event noise requirements are enforceable limits and represent an upper bound on the park's exposure to noise associated with airport operation. As part of the 1985 noise abatement plan, a maximum of 6.5 average daily departures are allowed by the "Base Class" aircraft, a Boeing 737-200. As stated in the noise abatement plan, "If an aircraft is quieter than the 'Base Class' aircraft, it may operate in greater numbers based on an 'equivalency' formula. The limitation applies to all scheduled commercial aircraft having published noise levels above 86 dBA on approach and above 74.5 dBA on departure."

In response to proposals by two airlines in 1984 to schedule flights that would have exceeded the 6.5 average daily departures limit, the Jackson Hole Airport Board adopted an access plan that identified a limited number of slots and a method for allocating them among the airlines. The two airlines subsequently withdrew their proposals and it was not necessary to implement the access plan.

Based on advances in aircraft noise technology since then, the 45-decibel DNL and 55-decibel DNL contours have never been exceeded and the number of average daily departures has remained below the specified limit of 6.5 "Base Class" aircraft equivalents. As a result, it has not been necessary to make allocations under the access plan.

The Jackson Hole Airport Board and its consultant have substantially upgraded the airport noise measurement capabilities in recent years. Improvements have included installing year-round monitoring equipment and integrating the noise monitoring equipment with the data provided by the Federal Aviation Administration's Air Traffic Control Beacon Interrogator-6 aircraft tracking system at the airport. This provides virtually real-time data on noise events tied to specific aircraft operating in the airspace over the park.

Data Collection and Reporting. The Jackson Hole Airport attempts to collect information for each aircraft takeoff and landing through the use of automated, continuous sound monitoring and meteorological instrumentation. Data include aircraft type and air carrier (if applicable), maximum sound level in dBA and the time it occurred, sound exposure level (SEL), and physical parameters that can affect sound, including temperature, wind speed, and wind direction. These data are analyzed to confirm that violations of the standards are not occurring.

Ban on Stage 2 Aircraft. On June 28, 2004, the Jackson Hole Airport began enforcing a rule prohibiting the operation of the older, louder Stage 2 aircraft that contributed disproportionately to sound impacts on the park. The Jackson Hole Airport is one of only a few airports in the nation that have been allowed to implement such a ban, and this authorization required an act of Congress. Under the Town of Jackson Municipal Code, violations of the rule result in a mandatory court appearance and fines.

Preferential Runway Use. Section 4(e) of the 1983 agreement requires the Board to take all reasonable measures to notify aircraft operators to avoid noise-sensitive areas of Grand Teton National Park, and to encourage aircraft approaches from and takeoffs toward the south. To implement this requirement, the Board makes preferential runway use information widely available through the airport website, an insert for pilot notebooks, air traffic control broadcasts, aeronautical publications, magazines, and other materials typically used by pilots for flight planning. The procedures indicate that Runway 01 (from the south) is the preferred arrival runway and Runway 19 (to the south) is the preferred departure runway.

Voluntary Curfew. Under the Airport Noise and Capacity Act, the Jackson Hole Airport Board cannot unilaterally impose a mandatory curfew. Therefore, the Board has adopted a voluntary curfew between 11:30 P.M. and 6:00 A.M. for landing and 10:00 P.M. and 6:00 A.M. for takeoff. The Board also has required commercial jet aircraft to schedule arrivals prior to 9:30 P.M. and departures no earlier than 7:00 A.M. Pilots are notified of the curfew using the same media described above for preferential runway use. Pilots also are advised that the airport and tower are not staffed overnight, that fire/rescue and other services are not available during this period, and that in winter, the runway, taxiway, and ramp are not plowed after the last scheduled passenger flight arrives, so that incoming planes risk landing on a snow-covered runway. Owners of aircraft that violate the voluntary curfew are notified by letter, reminded of the reasons for the curfew, and requested to refrain from further violations. During the summer and winter high seasons, an average of six aircraft per month violate the voluntary curfew.

Aircraft Tracking and Reporting. The airport staff monitors arrival of all aircraft with instrument flight rules flight plans through the use of Internet-based flight tracking services. The staff uses this monitoring to identify in advance if any arriving aircraft are of the banned Stage 2 type, and to identify aircraft that arrive late at night after the voluntary curfew has gone into effect.

Contract Requirements. All contracts between the Board and scheduled passenger service airlines require the airlines to ensure that their pilots know the sound abatement rules and procedures and to take appropriate action against employees for noise control plan violations without a valid reason. Similar language is included in the airport's contract with the fixed-base operator. The fixed-base operator must insert language intended to ensure compliance with the noise abatement plan into all subcontracts, and must distribute copies of the noise abatement plan to pilots departing from the airport.

Cooperation with Airport Tower. The Jackson Hole Airport has developed a good working relationship with the staff of the control tower, which is operated by contract through the Federal Aviation Administration. The tower personnel provide information to pilots by radio regarding sound abatement procedures and encourage pilot compliance.

EXISTING FACILITIES AT THE JACKSON HOLE AIRPORT

The Jackson Hole Airport is on 533 acres of park lands and includes both airside and landside facilities. The airport layout is shown in Figure 3.

Runway and Taxiway. The airport has one runway, designated 01/19, which is oriented approximately north-south. The runway is 6,300 feet long and 150 feet wide, and is asphalt overlaid with a porous friction course. Load-bearing capacity for the runway is 75,000 pounds for single-wheel landing gear, 200,000 pounds for dual-wheel gear, and 380,000 pounds for dual tandem gear. Additional paved areas, designated as blast pads, are at either end of the runway, and provide an additional paved area for aircraft that are unable to stop before reaching the end of the runway. These paved areas are 300 feet long and 150 feet wide, and are neither considered part of the runway nor used in calculating performance data for takeoff and landing. The taxiway is east of the runway and is 6,300 feet long and 75 feet wide. It includes four connectors used to access the runway.

Aircraft Parking Ramp. The ramp area provides parking for commercial and general aviation aircraft. About 35% of the ramp space is secured for scheduled passenger aircraft and can accommodate eight planes ranging in size from regional commuters to the Boeing 757-200. The remaining 65% of the ramp is for general aviation and can accommodate a variable number of aircraft, depending on their sizes.

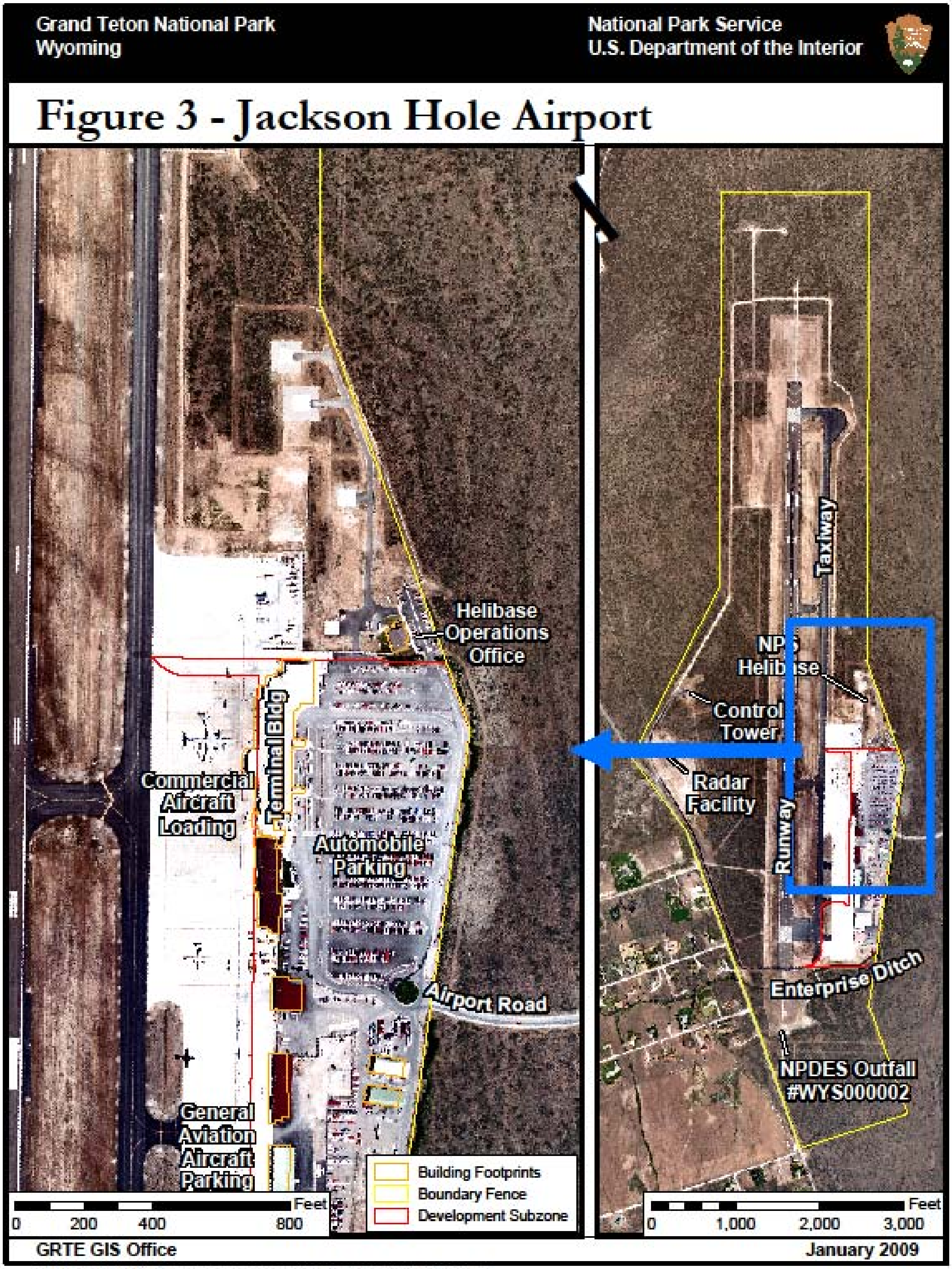
Navigational Aids. Navigational aids on the airfield include:

- A localizer antenna array and a glide slope antenna at the approach end of Runway 19. This equipment serves as the instrument landing system (ILS) for the airport, providing pilots with precise horizontal and vertical guidance to the runway.
- A very-high-frequency, omni-directional range (VOR) radio beacon that provides aircraft with radial guidance to and from the airport. The beacon is near the north end of the airfield, slightly west of the runway's extended centerline.

In the future, a differential global positioning system antenna will provide more precise approaches in connection with a ground-based augmentation system as part of the Next Generation Air Transportation System of the Federal Aviation Administration.

Lighting. The airport includes lighting systems that are used for night and low-visibility operations. All lighting systems are designed in accordance with Federal Aviation Administration requirements.

- Each end of the runway includes a medium-intensity approach lighting system (MALS), runway end identifier lights (REILs), and four-light precision approach path indicators.
- The runway is equipped with a high-intensity edge light system.
- The taxiway has a medium-intensity edge light system.
- The Jackson Hole Airport Board is considering the installation of runway center-line lights and touchdown landing zone lights to enhance the safety of operations.



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Air Traffic Control Tower. The air traffic control tower was completed in 2000 and operates under contract to the Federal Aviation Administration. The 68-foot-high tower is approximately 1,000 feet west of the runway. It is staffed from 7:00 A.M. to 9:00 P.M. daily. The primary purpose of the tower is to ensure the proper separation of aircraft operating near the airport and on the ground. The tower is surrounded by Class D airspace to a radius of 5 miles and a height of 3,000 feet above ground level. Within this airspace, all aircraft must be in radio contact with the tower and operating at the direction of the controller. Outside the Class D airspace, aircraft are controlled by the Salt Lake Air Route Traffic Control Center.

Air Traffic Control Beacon Interrogator - 6. This facility provides tracking data for all aircraft with operational transponders in the vicinity of the airport. The data are provided to air traffic controllers in the Salt Lake Air Route Traffic Control Center and allow them to track aircraft in the airspace above and near the park. The system became operational in 2009. The aircraft tracking system improves safety and potentially will enhance the efficiency of operations by allowing more than one aircraft to operate on the localizer at once. This could decrease aircraft holding times (and associated noise) in the airspace above and near the park.

Development Subzone Facilities Owned by the Jackson Hole Airport Board. The size (28.5 acres) and boundaries of the development subzone, which is east of the runway and taxiway, were established by the 1983 agreement. Within this area, the Jackson Hole Airport Board may construct reasonably necessary facilities, but it may not expand outside the subzone. Facilities in the development subzone include the passenger terminal, parking areas, rental car facilities, hangars, administrative offices, maintenance and fire/rescue facilities, general aviation terminal and offices, and other support infrastructure. The terminal is currently undergoing an expansion and remodel to better accommodate current and reasonably foreseeable passenger flows, which depend on recreation visits to the area and are highest in the summer and winter, and lower in spring and fall.

Other Development Subzone Infrastructure. Hangars 4 and 5 and the south fuel farm are owned by the fixed-base operator, and the rental car service buildings are owned by rental car operators. All of these facilities will become the property of the Jackson Hole Airport Board after terms of years that are specified in individual contracts (Bishop 2008).

Interagency Helibase. North of the development subzone, the National Park Service operates an interagency helibase at the Jackson Hole Airport. The 5-acre helibase includes a 2,500-square-foot office building, three helicopter landing pads, an underground fuel storage system, security fencing, and parking.

Future Development. If, in the future, the Jackson Hole Airport Board proposed any actions that would extend the length of the runway or expand the size of the airport to encompass additional NPS lands, the National Park Service would require that the National Environmental Policy Act process would have to evaluate at least one alternative that would relocate the airport to a site not in Grand Teton National Park. No amendment to the agreement between the Department of the Interior and the Jackson Hole Airport Board that would authorize either such action would occur in the absence of such a National Environmental Policy Act process.

FEDERAL FUNDING OF THE JACKSON HOLE AIRPORT

Funding Sources

Funding for the Jackson Hole Airport comes from several sources, including operating revenues, security screening revenues, and Federal Aviation Administration grants.

Operating Revenues. Airport operating revenues are derived from scheduled passenger service airline landing fees and ramp rents, general aviation landing fees, parking, rental car fees, and other tenant rents. In most recent years, revenues from these sources minus operating expenses have produced annual surpluses of about $600,000 that can be applied to facilities repair, refurbishing, and improvements.

Security Screening Revenue. The Jackson Hole Airport Board provides security screening for the Transportation Security Administration on a contract basis. It can apply any surplus income from these services to capital improvements.

Federal Aviation Administration Grants. The airport receives Federal Aviation Administration grant funds under the Airport Improvement Program and passenger facility charges. Some of these funds are classified as "entitlement" based on passenger numbers, and others are "discretionary" and are based on project priority and need. Because passenger facility charge funds are tied to the Airport Improvement Program, a loss of Federal Aviation Administration funding would result in the loss of eligibility for both funding sources.

At airports like the Jackson Hole Airport that meet Part 139 certification (described below) and fall in the Federal Aviation Administration's "non-hub, primary" classification, grants cover 95% of eligible project costs. Eligible projects enhance airport safety, capacity, security, and environmental concerns through airfield capital improvements or repairs. These funds cannot be used for airport operations or for revenue-generating improvements, such as hangars, parking lots, and non-aviation development.

Requirements for Maintaining Federal Funding

Part 139 Certification. Each year under Title 14, Part 139 of the *Code of Federal Regulations*, the Federal Aviation Administration performs a certification inspection of airports that support scheduled, passenger-carrying operations and/or unscheduled passenger-carrying operations using aircraft designed for at least 31 passenger seats. Some of the areas of concern include the condition of pavement and other facilities, firefighting equipment, and record-keeping.

As described above, Federal Aviation Administration grants that are tied to maintaining Part 139 certification cover 95% of eligible project costs. These grants represent more than 70% of all funding that is available to the Jackson Hole Airport Board for facilities operation and for capital improvements (see the funding sources identified above). These grants are essential to maintain a level of safety and security that will support scheduled passenger service aviation at the Jackson Hole Airport.

Maintaining a Satisfactory Property Interest. The Federal Aviation Administration needs to ensure that the nation's taxpayers receive the full benefit of airport improvements, and that costs are appropriately amortized over time. Therefore, in situations such as the Jackson Hole Airport where the airport development sponsor (in this case, the Jackson Hole Airport Board) does not own the underlying land, the sponsor must demonstrate that it has a "satisfactory property interest." Otherwise, the airport will not be eligible for Federal Aviation Administration funding.

The Airport Aid Program is defined in Title 14, Part 152 of the *Code of Federal Regulation.* Section 152.103 states, "To be eligible to apply for a project for airport development [the sponsor must have] satisfactory property interests in the lands to be developed or used as part of, or in connection with, the airport." According to the definitions in section 152.3, satisfactory property interest means "Title free and clear" or "a lease of not less than 20 years granted to the sponsor by another public agency, or the United States, that has title [free and clear]."

As described previously, the existing airport agreement does not expire until April 27, 2033. However, based on the 20-year requirement, the Jackson Hole Airport would not have a satisfactory property interest, and would not be eligible for Federal Aviation Administration funding, after April 27, 2013. Because of funding cycles that result in long delays between when funds are requested and when they are made available, effects on airport funding already are occurring (Bishop 2009). Therefore, the justification for extending the agreement is to allow the Jackson Hole Airport maintains its eligibility for Federal Aviation Administration funding between now and 2033.

If Federal Aviation Administration funding was eliminated at the Jackson Hole Airport, scheduled passenger service or unscheduled service by aircraft with 31 or more passenger seats could continue, so long as the Jackson Hole Airport Board was able to maintain its Part 139 certification by passing the annual inspection. However, without this key funding source, conditions eventually would deteriorate to the point where certification could not be maintained. At that time, scheduled passenger service and unscheduled service on larger aircraft would end, and passengers wanting to fly into the area by any method other than small, unscheduled general aviation aircraft would have to use an alternate airport. For consistency, all analyses in this environmental impact statement assume that loss of Part 139 certification would occur in 2015, although the Board might be able to maintain certification well beyond that year.

Some general aviation could continue at Jackson Hole Airport in the absence of Part 139 certification. However, some pilots of general aviation aircraft carry insurance that will not cover flights into airports that are not Part 139 certified, and pilots of other aircraft may avoid the facility because of concerns about safety and security.

CURRENT USE OF THE JACKSON HOLE AIRPORT AND OTHER AIRPORTS IN THE REGION

Jackson Hole Airport

Jackson Hole Airport supports both scheduled passenger service and general aviation in western Wyoming and eastern Idaho. Based on data from the airport tower, the airport averages 80 to 90 operations per day on an annual basis (an operation is a takeoff or a landing), although the number varies from year to year and seasonally. Data analyzed in the aircraft sound and air quality models for this environmental impact statement were collected from the 12-month period of October 2004 through September 2005, which had 33,005 operations. Operations for subsequent years included 32,202 in 2006; 30,537 in 2007; and 30,091 in 2008. The following statistics are for 2009:

- There were a total of 29,003 operations.

- July and August were the busiest months, with an average of 142 operations per day and a peak day of 227 operations.
- April and November were the least-busy periods, averaging 41 operations daily with a peak day of 73 operations.
- Scheduled passenger aviation (both air carrier and regional / commuter airlines) made up approximately 25% of operations. Approximately 75% was general aviation, including air taxi or charters operating under the requirements for commuter and on-demand operations in 14 *Code of Federal Regulations* Part 135.

Scheduled passenger service at the Jackson Hole Airport currently is provided by American, Delta/Delta Connection, United/United Express, and Frontier. During the peak season and depending on the day of the week, there can be from 12 to 20 regularly scheduled arrivals and an equal number of departures each day, totaling 24 to 40 daily operations. Currently or recently used types of aircraft include the Airbus A319 (typically about 124 seats); Boeing 737 (124 seats) and Boeing 757 (188 seats); Bombardier CRJ-700 (68 seats); De Havilland Dash-8, commonly known as the Q-400 (70 seats); and De Havilland Canada DH8 (37 seats) (The Boyd Group, Inc. 2007a; Bishop 2008). The regularly scheduled passenger carriers provide direct, non-stop flights to/from Chicago, Denver, Minneapolis, Atlanta, Dallas, Salt Lake City, and Los Angeles.

In the decade from 1995 through 2004, scheduled passenger service was relatively steady, with an average of 190,000 enplanements (see glossary for definition) annually from the Jackson Hole Airport. Since then, enplanements climbed to a high of about 311,000 in 2008, and then declined slightly, to about 290,000 enplanements in 2009 (Bishop 2009). Most of the change is attributed to tourism.

July and August typically are the busiest months and together account for about 30% of the annual enplanements. Approximately 10% of summer park visitors to Grand Teton National Park arrive by airplane through the Jackson Hole Airport (Braak *et al.* 2009). April, May, and November are between the summer and winter tourist seasons and have the lowest numbers of enplanements.

During the peak winter tourism season of January through March, the Jackson Hole Airport averaged about 28,600 monthly enplanements in 2008 and 25,300 monthly enplanements in 2009. Primary destinations for most winter visitors who travel by air include the town of Jackson and/or the nearby Snow King Resort, Jackson Hole Mountain Resort, Grand Targhee Resort, White Pine Ski Area, and Yellowstone National Park. However, almost all of these people also visit Grand Teton National Park for recreation purposes during their trip.

In 2009, the Jackson Hole Airport supported about 21,300 general aviation operations (including about 5,800 from the air taxi category). Data are not available regarding how many passengers arrive at the airport via general aviation.

Other Regional Airports

Table 2 lists selected characteristics of the Jackson Hole Airport and other regional airports that provide scheduled passenger service.

The closest airport with scheduled passenger service is in Idaho Falls, Idaho. This airport is served by four airlines and has about half the annual enplanements of the Jackson Hole Airport. After the Jackson Hole Airport, the Idaho Falls Regional Airport is the facility most commonly used by people who travel to the Jackson area by air. About half of the Grand Targhee Resort winter visitors who fly to the area arrive through the Idaho Falls Regional Airport, but most other winter visitors to Jackson and the other area resorts arrive through the Jackson Hole Airport. Driving time to the Jackson Hole Airport from the Idaho Falls Regional Airport is about 2.5 hours.

Yellowstone Regional Airport in Cody, Wyoming, 133 miles by road from the Jackson Hole Airport, and Gallatin Field Airport, 208 miles away by road in Bozeman, Montana, are the next closest airports that provide scheduled passenger service. Because U.S. Highway 89/287 through the northern part of the John D. Rockefeller, Jr. Memorial Parkway and into Yellowstone National Park is closed in winter, it is impractical for travelers wanting to visit the Jackson area during this season to use these airports. Although both airports can be reached in winter by taking circuitous routes that largely bypass the parks, it is a several-hour-long drive from Jackson to either airport under the most favorable weather and road conditions.

The largest airport in the region is in Salt Lake City, Utah, which is 313 miles and more than 6 hours from the Jackson Hole Airport by automobile. Most visitors to Grand Teton National Park and/or Jackson who enter the area through the Salt Lake City airport arrive during the summer. Often, they will rent a vehicle in Utah and travel to several destinations, including other national parks and monuments, within the region.

TABLE 2: CHARACTERISTICS OF REGION AIRPORTS WITH SCHEDULED PASSENGER SERVICE [a/]
(Distances are from the Jackson Hole Airport)

Airport (Code)	**Air Distance (statute miles)**	**Road Distance (statute miles)** [b/]	**Aircraft Operations (takeoffs or landings) per day**	**Scheduled Passenger Aircraft Use (percent)**	**Runway Length (feet)**
Jackson Hole Airport, WY (KJAC)	0	0	90 [c/]	45 [c/]	6,300
Idaho Falls Regional Airport, ID (KIDA)	67	99	131	2	9,000
Yellowstone Regional Airport, Cody, WY (KWYS)	77	133	53	3	8,400
Gallatin Field Airport, Bozeman, MT (KBZN)	151	208	184	9	9,000
Salt Lake City International Airport, UT (KSLC)	205	313	1,247	38	12,000

a/ Except as noted, all data are from the AirNav, LLC web site at <http://www.airnav.com>. Air distances were converted from the Internet site's nautical miles to the more familiar statute miles.

b/ Road distances are from Google Maps, which is available on the internet at Maps.Google.com. The end destination is the Jackson Hole Airport (1250 E Airport Rd, Jackson, WY 83001 (Jackson Hole Airport-Jac) @43.600965,-110.730178).

c/ Average operations per day for the Jackson Hole Airport are from data provided by the airport control tower for the period October 2004 through September 2005.

PLANNING DIRECTION AND GUIDANCE

This section defines the basis for any actions taken at Grand Teton National Park. Guidance and direction include the core goals and objectives of the park, the goals of the National Park Service as they relate to the park, any park-specific mandates and administrative commitments, and servicewide mandates and commitments that the National Park Service applies to all units under its administration.

CORE GOALS AND OBJECTIVES FOR GRAND TETON NATIONAL PARK

This section describes the legislative history of Grand Teton National Park and the park's purpose and significance. It defines why the park was created and why it is special. These are the fundamental criteria against which the appropriateness of all recommendations, operational decisions, and actions are tested.

Park Establishing Legislation

Congress established Grand Teton National Park on February 26, 1929. It was "dedicated and set apart as a public park or pleasure ground for the benefit and enjoyment of the people of the United States under the name of Grand Teton National Park of Wyoming" (45 Stat. 1314). The park was enlarged to its present size by Congress on September 14, 1950 (Public Law 81-787, 64 Stat. 849). The expansion was "for the purpose of including in one national park, for the public benefit and enjoyment, the lands within the present Grand Teton National Park and a portion of the lands within the Jackson Hole Monument."

Park Purpose and Significance

The park's purpose and significance statements are based on legislative history and historic trends, and describe why the area was set aside as a national park unit. The purpose and significance help define management priorities for the protection of the resources and values that are the foundation of the park.

The purpose and significance statements, provided below, were developed as part of the park's foundation for planning and management (NPS 2006c). Collectively, these are the formal statements of Grand Teton National Park's core mission that provide basic guidance for all decisions to be made about the park.

The purpose of Grand Teton National Park is to:

- Preserve and protect the spectacular scenery of the Teton Range and the valley of Jackson Hole.
- Protect a unique geologic landscape that supports abundant diverse native plants and animals and associated cultural resources.
- Protect wildlands and wildlife habitat within the greater Yellowstone area, including the migration route of the Jackson elk herd.
- Provide recreational, educational, and scientific opportunities compatible with these resources for enjoyment and inspiration.

The significance of Grand Teton National Park and the adjacent John D. Rockefeller, Jr. Memorial Parkway includes the following:

- The iconic mountain landscape of the Teton Range rises dramatically above the flat valley of Jackson Hole, creating a compelling view that has inspired people to explore and experience the area for thousands of years. The sudden rise of rugged peaks contrasts with the horizontal sagebrush flats. Glacial lakes at the foot of the mountains reflect and expand the view. Opportunities to view an impressive array of wildlife are extraordinary. The awesome grandeur of the ever-present Teton Range under changing weather and seasons provides the superlative setting for unmatched visitor experiences.
- Grand Teton National Park preserves one of the world's most impressive and highly visible fault block mountain ranges, which abruptly rises 7,000 feet and is juxtaposed with landscapes shaped by glacial processes and braided river geomorphology. The Teton Range is one of the continent's youngest mountain ranges, yet exposes some of the oldest rocks on earth.
- Grand Teton National Park and the John D. Rockefeller, Jr. Memorial Parkway are at the heart of one of the earth's largest intact temperate ecosystems with a full complement of native Rocky Mountain plants and animals, including grizzly bears, wolves, North American bison, pronghorn, and one of the world's largest elk herds.
- The park and parkway represent one of the most notable conservation stories of the 20th century, and continues to inspire present and future generations. The formation of the park, a process that took more than half a century, was a struggle between private economic interests and a concern for conserving the Teton Range and valley floor. From prehistoric times to present day, numerous diverse cultures, cultural trends, and cultural values were influenced by the Teton Range and Jackson Hole valley.
- Within the park and parkway, visitors can easily experience peaceful solitude, wilderness character, and a rare combination of outdoor recreational and educational activities, world-renowned wildlife and landscapes, and the cultural amenities of a vibrant community throughout the year. Visitors of all abilities and interests can enjoy opportunities for physical, emotional, and inspirational experiences in an unspoiled environment.
- As part of the greater Yellowstone ecosystem, the park and parkway offer easily accessible and unparalleled opportunities for scientific research and educational study of temperate-zone natural systems and processes in a range of elevations, and human relationships to these systems. The relatively pristine landscape serves as "control" or baseline for scientific study.

Fundamental Resources and Values

In the foundation for planning and management, the National Park Service (2006c) identified seven fundamental resources and values that are the most important systems, processes, features, visitor experiences, stories, sounds, scents, and other resources and values to be communicated to the public about Grand Teton National Park. They warrant primary consideration during planning and management because they contribute to significance and are critical to achieving the park's purpose. They include:

- Scenery;
- Geologic processes;
- Ecological communities;

- Aquatic resources;
- Cultural history and resources;
- Natural soundscape; and
- Visitor experience in an outstanding natural environment.

Other resources and values may have particular importance that warrant special consideration during park planning and management efforts, even though they do not contribute directly to the purpose and significance of the park and are not considered park fundamental resources and values. These include several national historic landmarks, the Native American Vernon Collection, existing park assets, and sustainable economic contribution to the regional economy.

NPS MISSION AND MISSION GOALS

Organic Act Prohibition against Impairment

The most important statutory directive for the National Park Service is provided by the NPS Organic Act of 1916 (Title 16, *United States Code*, section 1). The key statement that guides the National Park Service in park management is as follows.

> *[The National Park Service] shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified . . . by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.*

This prohibition against impairment is the cornerstone of the Organic Act and establishes the primary responsibility of the National Park Service (NPS 2006a). All activities and planning of the National Park Service tier from this statement.

The NPS mission is presented in the *National Park Service Strategic Plan* (NPS 2000b). It states:

> *The National Park Service preserves unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.*

Mission Goals

Mission goals in the *National Park Service Strategic Plan* (NPS 2000b) articulate the broad ideals and vision that the National Park Service is trying to achieve at all national park units, including Grand Teton National Park. They are written as desired outcomes in keeping with the Government Performance and Results Act (GPRA). Mission goals that probably are applicable to extending the agreement for Jackson Hole Airport at Grand Teton National Park include the following:

- Ia. Natural and cultural resources and associated values are protected, restored, and maintained in good condition and managed within their broader ecosystem and cultural context.

- Ib. The National Park Service contributes to knowledge about natural and cultural resources and associated values; management decisions about resources and visitors are based on adequate scholarly and scientific information.
- IIa. Visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities.
- IIb. Park visitors and the general public understand and appreciate the preservation of parks and their resources for this and future generations.

SPECIAL MANDATES AND ADMINISTRATIVE COMMITMENTS

Special mandates and administrative commitments refer to park-specific requirements. More than a dozen of these are associated with Grand Teton National Park. The special mandates or administrative commitments that could apply to extending the 1983 agreement for the Jackson Hole Airport are described below.

Continuation of Leases and Permits

The authority for this special mandate is Public Law 81-787, the 1950 act that established the current Grand Teton National Park. This act required that any valid leases, permits, or licenses that were in effect at the time the park was established remain in effect in accordance with their provisions.

Jackson Hole Airport was established and operating at its current site before the land in the vicinity was incorporated into a unit of the national park system. As described earlier in this chapter under the heading "Project Background," parts of the airport site were leased from the Bureau of Land Management, State of Wyoming, and several other entities. Therefore, Public Law 81-787 preserved the rights of the airport to continue to lease and use the land within Grand Teton National Park. Since the park was established, this right to operate has been maintained under a continuous series of permits or agreements.

Department of the Interior Airports Act

On March 18, 1950, Congress passed the Department of the Interior Airports Act, sometimes commonly called the Airports in Parks Act. The full text of this act's provisions, from the current version of the *United States Code*, Title 16, Chapter 1, Subchapter I, sections 7a-7e, is in Appendix B of this environmental impact statement. A summary of its key provisions was included earlier in the "Background" section. The determination under this act by the Secretary of the Interior "that the continued operation of the Jackson Hole Airport is necessary to the proper performance of the functions of the Department and that no feasible and prudent alternatives thereto exist" was reaffirmed in the preamble to the 1983 agreement.

Reverter Clause

In 1949, John D. Rockefeller, Jr. made a gift to the United States of approximately 33,000 acres of land that are now within the boundary of Grand Teton National Park. Because the establishment of the park was not completely assured at the time of his donation, he included a clause, commonly called the "Rockefeller reverter," that applied to about 14,000 acres of the property. If any part of the lands subject to the reverter clause ever ceased to be part of a national park or national monument, the entire 14,000 acres would revert back to the Jackson Hole Preserve, Inc. or its successors. (Jackson Hole Preserve, Inc. is the company that was established to effect the transfer of lands to the federal government on behalf of John D. Rockefeller, Jr., and that continues to exist today.) Approximately 120 acres of the land within the 533-acre airport boundary are subject to this reverter clause.

Airport Agreements

Beginning in 1955, the Department of the Interior entered into a series of agreements regarding the Jackson Hole Airport. A description of the 1983 agreement, which currently is in effect, was provided in the "Background" section. The complete text of that agreement, including its two amendments, is presented in Appendix C. The 1983 agreement authorizes the use of the Jackson Hole Airport through April 27, 2033.

SERVICE-WIDE MANDATES AND POLICIES

As with all NPS units, management of Grand Teton National Park is guided by numerous laws, executive orders, policies, and regulations. Some of these laws and executive orders are applicable primarily to units of the national park system. These include the 1916 Organic Act, described earlier, that created the National Park Service; the General Authorities Act of 1970; and the act of March 27, 1978 relating to the management of the national park system. Others have broader application, such as the Endangered Species Act, the National Historic Preservation Act, and Executive Order 11990 addressing the protection of wetlands. The National Park Service must endeavor to meet all of these requirements, regardless of the alternative selected regarding the agreement for the Jackson Hole Airport.

Other Laws and Executive Orders

Desired future conditions prescribed by national laws and executive orders are relevant to the management of Grand Teton National Park regardless of the alternative selected for the airport agreement. Therefore, under any management approach for the airport, the National Park Service will, among other actions, strive to protect endangered species, improve water quality, maintain wilderness character, prevent obstruction of floodplains, protect archeological sites, preserve historic structures, and provide access for citizens with disabilities.

Management Policies

The National Park Service has established policies for all units under its stewardship. These are identified and explained in the NPS guidance manual titled *Management Policies 2006* (NPS 2006a). Major sections of these policies that relate to the presence and operation of the Jackson Hole Airport within Grand Teton National Park include The Foundation, Land Protection, Natural Resource Management, Cultural Resource Management, Use of the Parks, and Park Facilities.

Appropriate Use

Section 1.5 of *Management Policies 2006*, Appropriate Use of the Parks, directs the National Park Service to ensure that park uses that are allowed would not cause impairment of, or unacceptable impacts on, park resources and values. A new form of park use may be allowed within a park only after a determination has been made that, in the professional judgment of the park manager, it will not result in unacceptable impacts.

Section 8.1.2 of *Management Policies 2006*, Process for Determining Appropriate Uses, provides evaluation factors for determining appropriate uses. All proposals for park uses are evaluated for:

- Consistency with applicable laws, executive orders, regulations, and policies;
- Consistency with existing plans for public use and resource management;
- Actual and potential effects on park resources and values;
- Total costs to the Service; and
- Whether the public interest will be served.

Park managers must continually monitor all park uses to prevent unanticipated and unacceptable impacts. If unanticipated and unacceptable impacts emerge, the park manager must engage in a thoughtful, deliberate process to further manage or constrain the use, or to discontinue it.

From section 8.2 of *Management Policies 2006,* to provide for the enjoyment of the parks, the National Park Service will encourage visitor activities that:

- Are appropriate to the purpose for which the park was established; and
- Are inspirational, educational, or healthful, and otherwise appropriate to the park environment; and
- Will foster an understanding of and appreciation for park resources and values, or will promote enjoyment through a direct association with, interaction with, or relation to park resources; and
- Can be sustained without causing unacceptable impacts to park resources and values.

Operation of the Jackson Hole Airport within Grand Teton National Park is an appropriate use. The 1950 Department of the Interior Airports Act authorized the Secretary of the Interior to allow the operation of airports within national parks when necessary for the proper performance of the functions of the Department of the Interior. Pursuant to the authority provided in that legislation, the Secretary of the Interior made that determination in the 1983 agreement between the Department of the Interior and the Jackson Hole Airport Board. The analysis of whether this appropriate use can be sustained without unacceptable impacts on park resources and values is found at the end of "Chapter 4, Environmental Consequences" in this environmental impact statement.

Impairment and Conservation of Park Resources and Values

The guidance in *Management Policies 2006* requires analysis of potential effects to determine whether or not actions would impair park resources. The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. Section 1.4.3 of *Management Policies 2006* states that

> *The fundamental purpose of all parks also includes providing for the enjoyment of park resources and values by the people of the United States . . . Congress, recognizing that the enjoyment by future generations of the national parks can be enjoyed only if the superb quality of park resources and values is left unimpaired, has provided that when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant. This is how courts have consistently interpreted the Organic Act.*

However, the laws give the National Park Service the management discretion to allow impacts on park resources and values when necessary and appropriate to fulfill the purposes of the park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within the park, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values. An impact to any park resource or value may, but does not necessarily, constitute an impairment, but an impact would be more likely to constitute an impairment when there is a major or severe adverse effect on a resource or value whose conservation is

- Necessary to fulfill specific park purposes identified in the establishing legislation or proclamation of the park; or
- Key to the natural or cultural integrity of the park; or
- Identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the park, visitor activities, or activities by concessioners, contractors, and others operating in the park.

Management Policies 2006 recognizes that the impact threshold at which impairment occurs is not always readily apparent. Therefore, the National Park Service will apply a standard that offers greater assurance that impairment will not occur. The National Park Service will do this by avoiding impacts that it determines to be unacceptable. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment. Park managers must not allow uses that would cause unacceptable impacts; they must evaluate existing or proposed uses and determine whether the associated impacts on park resources and values are acceptable. A determination of whether the either alternative would result in unacceptable impacts or impairment is at the end of "Chapter 4, Environmental Consequences." A determination of impairment also is completed for each park resource and value analyzed in this environmental impact statement.

Director's Orders and Reference Manuals

Director's orders and their associated reference manuals or handbooks provide specific guidance on how to implement the service-wide mandates and policies specified in the Organic Act, other laws and executive orders, and *Management Policies 2006* (NPS 2006a). These documents are available on the Internet at http://www.nps.gov/applications/npspolicy/DOrders.cfm. The National Park Service is continuously updating director's orders and reference manuals based on such features as new or amended laws, technologies that modify best management practice, court rulings, and improvements in adaptive management procedures.

AVIATION LAWS AND POLICIES

Airport and Airways Improvement Act of 1982

The Airport Improvement Program was created by the Airport and Airways Improvement Act of 1982. It is the most significant source of Federal Aviation Administration funding for improvements at the Jackson Hole Airport. Over the past 13 years, the Jackson Hole Airport Board has received $37,557,436 in Airport Improvement Program grant funding, and an additional $9,294,524 in passenger facility charge funding (Jackson Hole Airport Board 2010).

An Airport Improvement Program grant can cover up to 95% of the costs of improvements addressing airport safety, capacity, security, or environmental matters. Under section 511 of the act, recipients of Airport Improvement Program grants must ensure that their airport "will be available for public use on fair and reasonable terms and without unjust discrimination."

Federal Aviation Administration Grant Assurances

In receiving grants under the Airport Improvement Program, the Jackson Hole Airport Board has been required to sign grant agreements containing 39 assurances. These assurances remain in effect for the useful life of the project funded, but not less than 20 years from acceptance of the Federal Aviation Administration grant. The grant assurances typically apply not only to the federally funded improvements, but also to all airport operations. Among other things, the Jackson Hole Airport Board has contractually assured the Federal Aviation Administration that it will:

- Not take any action that would deprive it of rights and powers necessary to perform the assurances;
- Not dispose of any airport property without approval from the Secretary of Transportation;
- Make the airport available for public use, on reasonable terms without unjust discrimination, to all types, kinds, and classes of aeronautical activities;
- Not grant any exclusive right for use of the airport by a person providing aeronautical services to the public;
- Maintain a fee and rental structure to make it as self-sustaining as possible under the circumstances;
- Use airport revenues only for aeronautical purposes; and
- Maintain a "satisfactory property interest" in airport property, which for airports such as the Jackson Hole Airport that operate on land owned by the United States, is "a lease of not less than 20 years … on terms that the [Federal Aviation Administration administrator] considers satisfactory."

Aviation Safety and Noise Abatement Act of 1979

The Aviation Safety and Noise Abatement Act gives the Federal Aviation Administration authority to issue regulations on "airport noise compatibility planning" and make funds available for projects contained in an approved noise compatibility program. Noise abatement policies in this act are spelled out in the *United States Code*, section 49, subsections 47501-47510.

The act requires the Secretary of Transportation to establish federal standards for measuring and assessing noise impacts on human receptors near airports. After consultation with appropriate agencies, the Secretary is required to:

- Establish a single system of measuring noise that has a highly reliable relationship between projected noise exposure and surveyed reactions of individuals to noise, and which apply uniformly in measuring noise at airports and surrounding areas;

- Establish a single system for determining the exposure of individuals to noise from airport operations, including noise intensity, duration, frequency, and time of occurrence; and
- Identify land uses normally compatible with various exposures of individuals to noise.

Part 150 Regulations

To implement the Aviation Safety and Noise Abatement Act, the Federal Aviation Administration has adopted regulations at Title 14, Part 150 of the *Code of Federal Regulations* (Part 150). These regulations establish:

- A-weighted sound pressure levels in units of decibels (dBA) as the single reliable system of measuring airport-related noise (section 150.9(a)).
- Yearly day-night average sound level (DNL) as the single system for determining the exposure of individuals to noise resulting from airport operations (section 150.9(b)).
- A threshold for incompatible land uses, which generally is at 65 DNL (section A150.101 in appendix A to Part 150).

The program established by Part 150 allows airport operators to prepare noise exposure maps and recommend measures in a noise compatibility program to reduce noise and non-compatible land uses. Airport operators may submit noise compatibility programs for Federal Aviation Administration approval, and may be eligible for Airport Improvement Program funding to implement approved noise abatement projects. The existing noise abatement plan for the Jackson Hole Airport was developed pursuant to a Part 150 study that was completed in 1985 and has periodically been updated, most recently in 2003.

Airport Noise and Capacity Act of 1990

Congress passed the Airport Noise and Capacity Act as a result of concerns over a proliferation of uncoordinated and inconsistent noise and access restrictions at airports throughout the United States. The act establishes a comprehensive national policy for regulating aviation noise, establishes criteria for noise and access restrictions at airports, and provides for an orderly phase-out of older, noisier Stage 2 aircraft weighing more than 75,000 pounds. It prohibits airport proprietors, such as the Jackson Hole Airport Board, from imposing access or capacity restrictions on Stage 3 aircraft without Federal Aviation Administration approval.

Under this act, a noise or access restriction on Stage 3 aircraft may become effective only if it is submitted to and approved by the Federal Aviation Administration. The Federal Aviation Administration will approve a restriction only if adequate opportunity has been provided for public comment, and the restriction:

- Is reasonable, non-arbitrary, and non-discriminatory;
- Does not create an undue burden on interstate or foreign commerce;
- Is not inconsistent with maintaining the safe and efficient use of the navigable airspace;
- Does not conflict with a law or regulation of the United States; and
- Does not create an undue burden on the national aviation system.

Since enactment of the Airport Noise and Capacity Act, the Federal Aviation Administration has not granted such approval to any airport.

Part 161 Regulations

The Federal Aviation Administration's regulations to implement the Airport Noise and Capacity Act are in Title 14, Part 161 of the *Code of Federal Regulations* (Part 161). The regulations establish a national program for the review of airport noise and access restrictions, and outline the evidence required to support approval of a restriction. Part 161 regulations also require that the measurements of noise levels at airports and surrounding areas, and the land uses that are normally compatible or non-compatible with various noise exposure levels, be identified in accordance with the procedures in Part 150.

Part 161 regulations contain procedures for proposing restrictions on the operation of Stage 3 aircraft, including Federal Aviation Administration approval requirements. Any application to restrict these aircraft would need to satisfy the statutory requirements in the Airport Noise and Capacity Act. These would include establishing that:

- A current or projected noise or access problem exists, and the proposed action could relieve the problem;
- Other available remedies are infeasible or would be less cost effective; and
- The noise or access standards are the same for all aviation users classes, or that the differences are justified.

The type and amount of data, rigor of the analysis, and other information needed for a Federal Aviation Administration Part 161 review typically require a lengthy, time-consuming, costly study. This process has never been applied in a national park environment.

Vision 100, Century of Aviation Reauthorization Act (Vision 100)

In 2003, Congress passed Vision 100, which reauthorized the Airport Improvement Program. Section 825 of Vision 100 authorizes a sponsor of a commercial service airport that does not own the airport land and is a party to a long-term lease agreement with a federal agency (other than the Departments of Defense or Transportation) to impose restrictions on, or prohibit the operation of, Stage 2 aircraft weighing less than 75,000 pounds, notwithstanding the requirements of the Airport Noise and Capacity Act or any other provision of law or regulation. This section of Vision 100 was sought by the Jackson Hole Airport Board to support adoption of a ban on all Stage 2 aircraft at the Jackson Hole Airport. To this extent only, Vision 100 exempts the Jackson Hole Airport Board from the requirements of the Airport Noise and Capacity Act, Aviation Safety and Noise Abatement Act, and federal grant assurance obligations.

Part 139 Certification

Each year, the Federal Aviation Administration performs a certification inspection of airports that support scheduled, passenger-carrying operations and/or unscheduled passenger carrying operations using aircraft designed for at least 31 passenger seats. These inspections are carried out under the requirements of Title 14, Part 139 of the *Code of Federal Regulations*. Areas subject to inspection include the condition of pavement and other facilities, firefighting equipment, and record keeping.

Federal Aviation Administration grants, which are tied to maintaining Part 139 certification, represent more than 70% of all funding available to the Jackson Hole Airport Board for facilities maintenance and capital improvements. These grants are essential to maintaining a level of safety and security that will support scheduled, commercial aviation at the Jackson Hole Airport.

SCOPING AND RESPONSE TO COMMENTS

Scoping is described in Chapter 5 under the heading "History of Public Involvement." Briefly, activities included the following.

- Preliminary internal scoping meetings were held in the autumn of 2005.
- In 2005, a newsletter was distributed that described the purpose and need for the extension of the agreement, presented preliminary alternatives, and solicited public input.
- A public notice with similar information was provided to the press on November 17, 2005.
- A notice of intent to prepare an environmental assessment for the Jackson Hole Airport agreement extension was published in the *Federal Register* on December 28, 2005.
- A notice of intent to prepare an environmental impact statement for the Jackson Hole Airport agreement extension was published in the *Federal Register* on August 9, 2007.

The public, which includes all of the diverse entities who have an interest in or knowledge about, are served by, or serve in the park (definition is included in Director's Order 75A) were invited to comment on the draft environmental impact statement.

- A notice of availability for the draft environmental impact statement for the Jackson Hole Airport agreement extension was published in the *Federal Register* on April 3, 2009.
- A 60-day public comment period was opened for the draft environmental impact statement on April 3, 2009. The comment period was extended by two weeks, until June 15, 2009, to accommodate users of the NPS' Planning, Environment, and Public Comment project management system.

In developing the final environmental impact statement, the National Park Service considered public and agency comments on the draft environmental impact statement, plus internal NPS comments, guidance, and direction. This final environmental impact statement addresses substantive comments as necessary, and presents a response to those comments in Appendix E.

IMPACT TOPICS: RESOURCES AND VALUES AT STAKE IN THE PLANNING PROCESS

This section identifies the resources and other values (impact topics) that could be affected by the alternatives. Justifications are provided regarding why there was no need to examine some impact topics in detail. Effects on the remaining impact topics were evaluated in "Chapter 4, Environmental Consequences," based on the issues that were identified during scoping. For each retained impact topic, the issues of concern from scoping are listed in the methods section in Chapter 4.

IMPACT TOPICS INITIALLY CONSIDERED

Impact topics focused the planning process and assessment of potential consequences of the proposed action and alternative of no action. The following were used to determine resources and values at stake in the Jackson Hole Airport agreement extension environmental impact statement:

- Topics that are identified in section 4.5.F.2 of *Director's Order #12 and Handbook: Conservation Planning, Environmental Impact Analysis, and Decision Making* (NPS 2001a). These include all of the topics that are included in Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act.
- Topics that were identified by NPS or airport personnel as having the potential to be affected by activities at the Jackson Hole Airport.
- Topics of concern to the public or other agencies that were identified during scoping. Activities to solicit public and agency comments are described in Chapter 5. Agency letters associated with scoping are included in Appendix A.

The National Park Service evaluates all potential impacts by considering the direct, indirect, and cumulative effects of each alternative on the environment, along with connected, cumulative, and similar actions. Impacts are described in terms of their context, duration, type, and intensity.

- The context or extent of the impact is described as localized or widespread.
- The duration of impacts is described as short-term, occurring only during or shortly after a specific action or treatment, or long-term, extending up to 20 years or more.
- Impact type can be beneficial or adverse.
- The intensity of impact is described as negligible, minor, moderate, or major.

Additional information regarding each of these is provided in "methods for Analyzing Impacts" at the beginning of Chapter 4.

The NPS equates the term "major" effects to the term "significant" effects as used in the National Environmental Policy Act and its implementing regulations. Where the intensity of an impact can be described quantitatively, numerical data are presented; however, many impact analyses are qualitative and use best professional judgment in making the assessment.

Table 3 summarizes the initial list of impact topics that was considered for this environmental impact statement. The table identifies whether each was retained for detailed analysis or dismissed. Justifications for dismissing impact topics from further consideration are provided below. Impact topics that were retained were evaluated in detail with regard to effects from extending the 1983 airport agreement in "Chapter 4, Environmental Consequences."

TABLE 3: SUMMARY OF IMPACT TOPICS INITIALLY CONSIDERED

Impact Topic	Retain or Dismiss
Natural Resources	
Air quality	Retain [a/]
Ecologically critical areas, wild and scenic rivers, or other unique natural resources	Dismiss
Endangered or threatened plants and animals and their habitats, and other species of special concern	Retain
Natural soundscape	Retain
Prime and unique agricultural lands	Dismiss
Soils	Dismiss
Vegetation	Dismiss
Visual quality and dark skies	Retain
Water quality and hydrology	Retain
Wetlands and floodplains	Dismiss
Wilderness	Dismiss
Wildlife and their habitats	Retain
Cultural Resources	
Important scientific, archeological, and other cultural resources	Dismiss
Archeological resources	Dismiss
Historic structures and buildings	Dismiss
Museum collections	Dismiss
Urban quality, historic and cultural resources, and design of the built environment	Dismiss
Cultural landscapes	Dismiss
Sacred sites and other ethnographic resources	Dismiss
Social and Economic Resources	
Conflicts with land use plans, policies, or controls	Dismiss
Energy requirements and conservation potential	Dismiss
Indian trust resources	Dismiss
Land use	Dismiss
Natural or depletable resource requirements and conservation potential	Dismiss
Noise	Dismiss
Park and airport operations	Retain
Public health and safety	Retain
Recreation	Dismiss
Socially or economically disadvantaged populations (environmental justice)	Dismiss
Socioeconomics	Retain
Surface and Air Transportation	Retain
Visitor use and experience	Retain

a/ Air quality was dismissed in the draft environmental impact statement, but concerns regarding this impact topic were raised in public and agency review comments. Therefore, a detailed analysis of potential impacts on air quality from the proposed action and its alternative was conducted for this final environmental impact statement.

IMPACT TOPICS DISMISSED FROM FURTHER CONSIDERATION

The National Park Service defines "measurable" effects as moderate or greater impacts. It equates "no measurable effect" with minor or lesser impacts. "No measurable effect" is used by the National Park Service in determining if a categorical exclusion applies or if impact topics may be dismissed from further evaluation in an environmental assessment or environmental impact statement. This approach concentrates the effort on the issues that are truly significant to the action in question, rather than amassing needless detail, and conforms to section 1500.1(b) of the Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act.

The National Park Service generally used "no measurable effects" in this environmental impact statement to determine whether to dismiss an impact topic from further detailed evaluation. However, this environmental impact statement evaluated several impact topics with minor or lesser effects at the request of the Jackson Hole Airport Board or because a high level of concern was indicated during scoping or review of the draft environmental impact statement.

This section provides a limited evaluation and explanation regarding why some impact topics were not evaluated in more detail. Impact topics were dismissed from further evaluation in this environmental impact statement if:

- They do not exist in the analysis area;
- They would not be affected by the action, or impacts would not reasonably be expected; or
- Through the application of mitigation measures, there would be minor or lesser effects (that is, no measurable effects) from the action, and there is little controversy on the subject or reasons to otherwise include the topic.

Because there would be no measurable effects on dismissed impact topics, the action's contribution toward cumulative effects for dismissed topics would be low or absent.

The National Park Service conducted a limited analysis of direct, indirect, and cumulative effects for the impact topics presented below because each resource is found in the analysis area and had issues applicable to one or both alternatives. There is no impairment analysis for the dismissed impact topics because impairment would involve a measurable adverse effect, and typically one of major or severe intensity on the resource.

Natural Resources

Ecologically Critical Areas, Wild and Scenic Rivers, or Other Unique Natural Resources. Unique natural resources and ecologically critical areas do not occur within or near the Jackson Hole Airport. Regionally, these resources would not be affected by the alternatives for extending the 1983 agreement and they were dismissed from further analysis in the document.

In March 2009, the Craig Thomas Snake Headwaters Legacy Act of 2008 was passed as part of the Omnibus Public Land Management Act of 2009. This act designated approximately 387 miles of the rivers and streams of the Snake River system as additions to the National Wild and Scenic River System. This includes the Snake River in Grand Teton National Park and the John D. Rockefeller, Jr. Memorial Parkway, as well as the Pacific Creek and Buffalo Fork tributaries. Because the airport does not adversely affect the outstandingly remarkable values defined in the legislation, or the free-flowing conditions or water quality of the designated segments, the topic of wild and scenic rivers was dismissed from further analysis in this environmental impact statement.

Native Vegetation. The native vegetation on and around the airport consists primarily of a sagebrush overstory with an understory of grasses and forbs. Neither alternative would result in construction or other activities that would substantially disturb the existing plant community. Operation activities within the development subzone are permitted by the existing agreement and generally consist of routine landscape maintenance. Vegetation disturbances associated with separate airport improvements would be addressed by the environmental compliance documents associated with each activity. Regardless of the alternative that is selected as a result of this environmental impact statement, the National Park Service and Jackson Hole Airport Board would continue to work together on such activities as managing invasive species. Therefore, this topic was dismissed from further analysis in this document.

Prime and Unique Agricultural Lands. Prime farmland has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Unique land is land other than prime farmland that is used for production of specific high-value food and fiber crops. Both categories require that the land is available for farming uses (Council on Environmental Quality 1980). The lands within the Jackson Hole Airport have not been available for farming for more than half a century, and neither alternative would result in a change in use that would allow them to be used for agriculture. Therefore, this topic was dismissed from further analysis.

Soils. This impact topic was dismissed because neither alternative for the 1983 agreement would substantially change the extent of soil disturbance associated with the airport. Moreover, because best management practices are routinely used in association with all soil-disturbing activities at the airport, soil losses are minimal.

Wetlands and Floodplains. The Jackson Hole Airport is on an upland site that is underlain by poorly consolidated, rapidly draining glacial deposits. As a result, wetlands have not developed in the vicinity of the airport, and effects on wetlands would not occur from either alternative. Because wetland resources are absent at and near the site, they were dismissed from further consideration.

The upland site on which the Jackson Hole Airport was constructed is well outside the 100-year floodplains of the Snake River, which is about 1.2 miles to the west, and the Gros Ventre River, which is more than 2 miles east of the runway. Because the alternatives for extending the 1983 agreement would not result in any changes within the floodplains of either of these waterways, floodplains were dismissed from further consideration.

Wilderness. There are no congressionally designated wilderness areas in Grand Teton National Park. In 1978, the National Park Service recommended that Congress include approximately 146,355 acres of the backcountry (about 47% of Grand Teton National Park) in the National Wilderness Preservation System. The recommended wilderness area includes most of the Teton Range within the park and several of the lakes at its base. The National Park Service manages this area as wilderness and maintains its eligibility for future wilderness designation.

There are several designated wilderness areas in the greater Yellowstone area. The closest to the Jackson Hole Airport include the Gros Ventre, Jedediah Smith, Teton, and Winegar Hole Wilderness Areas.

Neither alternative for extending the 1983 agreement would change wilderness suitability or eligibility for any recommended wilderness lands in Grand Teton National Park. Thus, this topic was dismissed from further analysis in this environmental impact statement. However, impacts on natural soundscapes that would occur in the recommended wilderness are addressed in the natural soundscape section of this document and impacts on visitors in the recommended wilderness are addressed in the visitor use and experience sections.

Cultural Resources

Based on section 1508.27 of the Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act, NPS guidance in *Director's Order #12 and Handbook* (NPS 2001a) requires consideration of "important scientific, archeological, and other cultural resources, including historic properties listed or eligible for the National Register of Historic Places." This broad category commonly is divided into archeological resources, historic structures and cultural landscapes, ethnographic resources, and museum collections. All of these were dismissed from detailed consideration in this environmental impact statement for the reasons described below. Compliance with section 106 of the National Historic Preservation Act was conducted for the proposed action and included an assessment of effect that is included in the correspondence in Appendix A. The section 106 assessment of effect was completed as a separate process from this National Environmental Policy Act environmental impact statement, but is included here for reference.

Archeological Resources. Archeological resources that potentially are eligible for listing in the National Register of Historic Places are known to occur within the boundaries of the airport and within its development subzone. However, no archeological resources would be impacted from the extension of the 1983 agreement. The proposed action does not include any new development, ground disturbance, or additional use beyond what is approved in the current agreement. In addition, archeological resources located on federal land already are protected by the National Historic Preservation Act of 1966. Under either alternative, the Jackson Hole Airport Board must continue to ensure their protection. This includes, but may not be limited to:

- Coordinating with the National Park Service, which is required to formally consult with the state historic preservation officer and tribes, as applicable under section 106 of the National Historic Preservation Act. The state historic preservation officer and/or tribe must then have 30 days to comment.
- Performing archeological surveys prior to any ground-disturbing activities.
- Ceasing all construction activities and notifying the National Park Service if any significant scientific, prehistorical, historical, or archeological resources are discovered during any ground-disturbing activities.

These measures are required for all actions, even those that would be classified as a categorical exclusion under the National Environmental Policy Act. They apply to actions under the current agreement, and would apply to any new actions proposed or conducted following an extension of the agreement. Thus, the proposal for two 10-year extensions of the agreement would have no effect on existing archeological resources. The proposal would neither impact existing resources nor change the method used to comply with the National Historic Preservation Act. Therefore, this impact topic was dismissed from further analysis in this environmental impact statement.

Historic Structures and Cultural Landscapes. Criteria for identifying historic structures are included in the National Register Federal Program regulations in Title 36, *Code of Federal Regulations,* Part 60.4. According to this source, potential consideration as "historic" does not begin until the structure is at least 50 years old, unless the property is of "exceptional importance." Properties older than 50 years can be evaluated for their significance in American history, architecture, archeology, engineering, and culture, based on their integrity of location, design, setting, materials, workmanship, feeling, and association.

Director's Order #12 and Handbook (NPS 2001a) requires consideration of cultural landscapes in the form of "urban quality, historic and cultural resources, and design of the built environment," based on section 1502.16 of the Council on Environmental Quality (1978) guidelines for implementing the National Environmental Policy Act. Cultural landscapes are considered for significance based on the same criteria as historic structures. That is, they typically must be at least 50 years old and must have significance related to American history, architecture, archeology, engineering, and culture.

The National Park Service surveyed the airport and access road area for historic structures and cultural landscapes, and completed a determination of eligibility on airport facilities. In the determination, the airport runway, access road, and terminal were found to be significant under National Register of Historic Places evaluation criterion C, in that they embody distinctive characteristics of a type, period, or method of construction relating to tourism. However, all three lack sufficient integrity to be eligible for listing. The Wyoming State Historic Preservation Office concurred with the NPS' finding that the property is ineligible. Therefore, there are no historic structures or cultural landscapes located at airport, including the runway and development subzone.

Impacts on cultural resources, such as visual and audio effects, also can occur beyond the immediate project area. Therefore, the National Park Service evaluated the potential for airport operations to cause impacts on historic structures and cultural landscapes outside the airport boundary. The only eligible or listed historic structures near the airport are associated with the Murie Ranch. Parts of the Murie Ranch were listed in the National Register of Historic Places in 1990, and the entire ranch was listed in 1997. The ranch was designated a national historic landmark in 2006.

On a typical summer day, approximately 70 aircraft pass within a mile of the ranch, but very few fly directly overhead. During other times of the year, there are substantially fewer aircraft overflights that may impact the ranch.

The National Park Service assessed the ranch's character-defining features identified in the nomination for the National Register of Historic Places to determine visual and audible effects of existing and projected future airport operations. The assessment employed evaluations for historic significance from 1997, 2006, and 2009.

Previous investigators determined that the site retained a high level of integrity, despite airport-related visual and audible impacts. Aircraft traffic was part of the soundscape of the area during the ranch's period of significance (1945-1980), with Western Airlines offering commercial passenger service from the airport at least since 1941 (Jackson Hole Airport Board 2006a). Therefore, the setting that the Murie family knew always included airport-related noise. The ranch was designated a national historic landmark in 2006 despite aircraft overflights and associated impacts that were similar to those currently occurring.

The projected increase in airport operations that would occur in 2025 from the proposed action, compared to 2005 operations, was not found to diminish the integrity of the site for listing in the National Register of Historic Places or to reduce interpretation as a historic place for conservation work. Therefore, the proposed action would have minor or lower impacts on the Murie Ranch.

The National Park Service completed section 106 compliance under the National Historic Preservation Act with the Wyoming State Historic Preservation Office and obtained its concurrence of a no adverse effect determination. The correspondence for the section 106 consultation is provided in Appendix A and contains more detail regarding the assessment of effect on visual and audible changes for the Murie Ranch. Based on the findings, and in consultation with the Wyoming State

Historic Preservation Office, historic structures and cultural landscapes were dismissed from further consideration in this environmental impact statement.

Ethnographic Resources. Executive Order No. 13007, "Indian Sacred Sites," requires federal land managers to accommodate access to and ceremonial use of Indian sacred sites by Native Americans, and to avoid adversely affecting the physical integrity of such sites. Procedures applicable to lands in national parks, which include the Jackson Hole Airport, are defined in Part 512, Chapter 3 of the *Department of the Interior Departmental Manual*.

Management of ethnographic resources is addressed in Chapter 10 of *NPS-28: Cultural Resource Management Guideline* (NPS 1998). This identifies ethnographic resources as "variations of natural resources and standard cultural resource types. They are subsistence and ceremonial locales and sites, structures, objects, and rural and urban landscapes assigned cultural significance by traditional users."

A number of tribes traditionally, and currently, value Jackson Hole for hunting, gathering, ceremonial, and other practices. Traditionally associated tribes include the Apache, Northern Arapaho, Blackfoot, Northern Cheyenne, Coeur d'Alene, Comanche, Crow, Gros Ventre, Kiowa, Nez Perce, Northern Paiute, Salish-Kootenai Group, Eastern Shoshone, Shoshone-Bannock, Assiniboine Sioux, Teton Sioux, Umatilla Group, and Yakama Group. Others may be identified (Walker and Graves 2007)

Grand Teton National Park holds many resources important to these tribes, including minerals; water; wildlife such as bison, elk, and pronghorn; and plants such as sagebrush and native grasses. These resources do not always have defined boundaries and may occur within and adjacent to the project area.

In 2005, the National Park Service conducted scoping with the tribes regarding the proposed action, but did not receive any comments. In 2009, the National Park Service submitted the draft environmental impact statement to each tribe for review and received no comments.

The National Park Service will continue to consult with the tribes about potential concerns associated with ethnographic resources. If tribes subsequently identify the presence of ethnographic resources, appropriate mitigation measures will be undertaken in consultation with the tribes. The locations of ethnographic sites would not be made public. In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered, provisions outlined in the Native American Graves Protection and Repatriation Act of 1990 (25 *United States Code* 3001) will be followed. For these reasons, and because the proposed action does not include any new development or ground disturbance that may affect any unknown ethnographic resource, this topic was dismissed from further consideration.

Museum Collections. *Management Policies 2006* (NPS 2006a) and *NPS-28: Cultural Resource Management Guideline* (NPS 1998) require consideration of impacts to museum collections, defined as artifacts, natural specimens, and archival and manuscript material. Because neither of the alternatives would change the location or conservancy of museum collections, or alter conservancy demands or requirements, this topic was dismissed from further consideration in this environmental impact statement.

American Indian Trust Resources. The Secretary of the Interior's Secretarial Order No. 3175, "Departmental Responsibilities for Indian Trust Resources," requires that any anticipated impacts on Indian trust resources from a proposed project or action by Department of Interior agencies must be explicitly addressed in environmental documents. The Federal Indian Trust Responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes. Because there are no American Indian trust resources identified or located in Grand Teton National Park, this topic was dismissed from further consideration in this environmental impact statement.

Social and Economic Resources

Conflicts with Land Use Plans, Policies, or Controls. This mandatory impact topic is based on sections 1502.16 and 1506.2(d) of the Council on Environmental Quality (1978) guidelines for implementing the National Environmental Policy Act. The primary land use plans, policies, or controls potentially associated with actions at the Jackson Hole Airport include the Grand Teton National Park master plan, the Jackson/Teton County comprehensive plan, and Teton County's Jackson Hole Airport resolution.

Provisions of these land use plans, policies, and controls that apply to the airport are identified later in this chapter under the heading "Connected, Cumulative, and Similar Actions." As described in that section:

- The park master plan seeks to minimize the intrusive effects of the airport. Because neither alternative would involve airport construction or expansion, intrusive effects would be no more obvious than under current conditions, and could be less evident.
- The Jackson/Teton County comprehensive plan states that airport issues are to be addressed in the future. Therefore, neither alternative for the Jackson Hole Airport agreement would represent conflicts with the existing comprehensive plan.
- The Jackson Hole Airport resolution imposes height and sound regulations outside the park that relate to the airport. Extending the 1983 agreement would not affect these regulations, and an alternative that let the agreement expire would preclude the need for the regulations.

It has been suggested that an alternative that allows the airport agreement to expire in 2033 is contrary to the Jackson Hole Airport master plan. However, the airport master plan is based on a 20-year timeframe, and the current plan, which was developed between 1992 and 1999, will be revised within the next decade, based on the terms then in effect in the agreement. The airport master plan could not apply beyond the term of the agreement. Therefore, no conflict would exist between the expiration of the agreement and the airport master plan or any other land use plans, policies, or controls, and this impact topic was dismissed from further consideration.

Energy Requirements and Conservation Potential. Fuel use for scheduled passenger service air travel is highly variable, depending on type of aircraft (larger planes generally move large numbers of passengers more fuel-efficiently), flight distance (long, nonstop trips are more fuel-efficient than short hops), and how full of passengers the plane is. However, most sources generally concur with the Geary (2005) that "A typical [Boeing] 737 flight containing 100 people flying a two-hour, 800-mile flight gets 50 miles per person per gallon – about the same as a car that gets 25 miles per gallon carrying two people." As described in "Current Use of the Jackson Hole Airport and Other Airports in the Region," air carriers fly many makes and models of aircraft into the Jackson Hole Airport. However, for illustrative purposes, this efficiency for moving people probably is reasonable for the airport, where flights arrive from Chicago (1,170 miles), Denver (405 miles), and Salt Lake City (205 miles).

The fuel-use per passenger-mile value indicates that although the agreement alternatives may change whether fuel is burned in a car or airplane engine, they would have a negligible effect on the amount of energy used for travel to the vicinity. Moreover, changes in energy use associated with the alternatives would not be detectable either locally or regionally when compared to the fuel used annually during 2.4 million recreational visits and 1.6 million non-recreational visits to Grand Teton National Park (NPS 2004a), gasoline consumed by Teton County's 19,000 residents, or energy used for other purposes, such as heating and lighting. Therefore, differences between the alternatives regarding energy requirements and conservation potential were dismissed from further consideration.

Land Use. Neither alternative would result in any construction or produce any conversions in land use within the park for at least 25 years. The indirect effects on the availability of scheduled passenger air service on land use outside the park is considered in the "Socioeconomics" section in Chapter 4. Therefore, this impact topic was dismissed from further analysis.

Natural or Depletable Resource Requirements and Conservation Potential. Natural or depletable resources address the quality, recycling, or conservation of petroleum products and other natural resources. The use and conservation of fuels and other energy sources, including petroleum products, was discussed above under energy requirements and conservation potential. Because neither alternative would authorize construction or any substantive changes in the operation of the airport for at least 25 years, differences between the alternatives for this impact topic would be negligible and this impact topic was not analyzed further.

Noise. Noise is defined as unwanted sound that disturbs routine activities or peace and quiet, and perhaps causes a feeling of annoyance (Federal Aviation Administration 2006a). The concerns associated with noise are addressed in this environmental impact statement under the impact topics of natural soundscape and visitor use and experience. As a result, noise was not considered separately as an impact topic.

Recreation. Within the park, the effects on recreation are included in "Visitor Use and Experience" in Chapter 4. The "Socioeconomics" section in Chapter 4 addresses recreation outside the park, such as effects on ski areas.

Socially or Economically Disadvantaged Populations (Environmental Justice): Executive Order 12898, General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Guidelines for implementing this executive order under the National Environmental Policy Act are provided by the Council on Environmental Quality (1997). According to the U.S. Environmental Protection Agency (1998), environmental justice is:

> *The fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.*

> *The goal of this "fair treatment" is not to shift risks among populations, but to identify potentially disproportionately high and adverse effects and identify alternatives that may mitigate these impacts.*

Minority and low-income populations were evaluated for local communities, the three-county area around Grand Teton National Park, and the states of Wyoming and Idaho. In the most recent census (2000), the minority population in the area of Teton County WY, Lincoln County WY, and Teton County ID was 5.4%, compared to 8.1% for Wyoming and 9.1% for Idaho. The percent minority population ranged from less than 3% in Lincoln County to almost 9% in Teton County, Idaho.

According to the 2000 census and current U.S. Census Bureau estimates, approximately 8% of the population within the three-county area lives below the poverty level. This value is lower than the statewide averages of approximately 11% for Wyoming and Idaho. Approximately 7% of the population in the town of Jackson lives below the poverty level.

Based on the characteristics of the populations of the three-county area and its component communities, there is no potential for the agreement alternatives to have disproportionate adverse effects on minority or low-income populations. Therefore, environmental justice was dismissed as an impact topic.

RELATIONSHIP TO OTHER PLANNING STUDIES

RELATIONSHIP TO PLANS OR STUDIES OF THE NATIONAL PARK SERVICE

Throughout the past 30 years, the National Park Service has developed numerous plans and implemented a wide range of management actions that could affect or be affected by extending the Jackson Hole Airport agreement. Plans and actions of the National Park Service are identified below, with a brief description of their potential relevance in association with the proposed action. A more complete analysis of their relevance is included in the cumulative effects analysis for each impact topic.

Grand Teton National Park Master Plan. The park's master plan (NPS 1976) provides general direction for management of the park. It addresses the Jackson Hole Airport in three locations, as follows:

- In the summary on page 2, the plan identifies management initiatives, which include the intent to "Further reduce unnecessary intrusion on the park by eventually . . . minimizing the influences of the Jackson Hole Airport."
- On page 8, the plan describes commitments by past National Park Service directors "to provide certain improvements for the Jackson Hole Airport." These were related to the need "to adequately handle twin-engine Convair 580's in use by commercial airlines." These aircraft are no longer used by the scheduled passenger service airlines that fly into the airport.
- Management goals for the Valley Zone are provided on page 20. This section states that "Because this area's resources inevitably receive the heaviest impact, major efforts must be made to keep resource damage to a minimum. Particular care must be taken with respect to the provision of facilities in this zone, because sizeable parts of it should be considered for re-classification when nonconforming uses are terminated. Particularly careful thought must be given to future treatment of the Jackson Hole Airport, because it intrudes directly upon Class III mountain-foreground land, and its air traffic profoundly influences virtually all of the park and its visitors."

Previous and Current Airport Agreement. Beginning in 1955, the Department of the Interior entered into a series of agreements regarding the Jackson Hole Airport. A description of the 1983 agreement, which currently is in effect, was provided earlier in Chapter 1. The complete text of the 1983 agreement and its two amendments is presented in Appendix B.

Area Plan and Environmental Assessment for the Craig Thomas Discovery and Visitor Center at Moose. This area plan (NPS 2002b) provided recommendations for improving visitor facilities and the visitor experience at Moose, including construction of the new Craig Thomas Discovery and Visitor Center, which opened in August 2007. Because this area is directly in line with and approximately 1,000 feet below the primary flight path north of the airport, the experience of visitors at this heavily used facility may be affected by the airport.

White Grass Ranch Rehabilitation and Adaptive Use Environmental Assessment / Assessment of Effect. Based on the guidance in this plan (NPS 2004b), the National Park Service is providing rehabilitation and adaptive use of the White Grass Ranch Historic District in Grand Teton National Park. The center will offer instruction on the preservation and rehabilitation of historic structures in the Intermountain West. This historic district is in a rather remote setting about three miles west of Moose.

Grand Teton National Park Strategic Plan. The strategic plan (NPS 2005b) covers the period from October 2005 through September 2008. It provides a mission statement and long-term goals, and describes how those goals will be accomplished. The annual performance plans tier off the strategic plan. The strategic plan acknowledges that the Jackson Hole Airport presents a unique set of challenges, but does not specifically address integration of the airport with meeting the plan's enumerated goals.

Winter Use Plans for Yellowstone National Park and Grand Teton National Park. The National Park Service has been involved in winter use planning for Yellowstone, Grand Teton, and the John D. Rockefeller, Jr. Memorial Parkway for many years. The winter use plans are applicable to this proposed action because extension of the 1983 agreement would allow the continuation of scheduled passenger service to the Jackson Hole area, which would likely affect the number of visitors to these parks in the winter. It also is relevant because the airport and motorized recreation during the winter produce sound that can affect the winter visitor's park experience.

The National Park Service published the *Winter Use Plans Final Environmental Impact Statement, Yellowstone and Grand Teton National Parks and the John D. Rockefeller Jr. Memorial Parkway* (NPS 2007b) and a final implementing rule in 2007, but the decision was vacated by the U.S. District Court in Washington, D.C. Since then:

- In 2008, the National Park Service published an environmental assessment addressing winter use plans for Grand Teton National Park, the John D. Rockefeller, Jr. Memorial Parkway, and Yellowstone National Park.
- In October 2009, a finding of no significant impact was issued for the winter use plan specific to Grand Teton National Park and the John D. Rockefeller, Jr. Memorial Parkway. A final rule implementing the decision was published in the *Federal Register* on November 20, 2009.
- A notice of intent to prepare a new environmental impact statement to manage winter use in Yellowstone National Park was published in the *Federal Register* in January 2010. Preparation of that document currently is underway.

Bison and Elk Management Plan for the National Elk Refuge, Grand Teton National Park, and John D. Rockefeller, Jr. Memorial Parkway. The U.S. Department of the Interior, U.S. Fish and Wildlife Service and National Park Service (2007) developed the bison and elk management plan and final environmental impact statement for managing bison and elk herds within the National Elk Refuge and Grand Teton National Park. This airport agreement evaluation considered the bison and elk management plan in several impact topics, particularly including socioeconomics.

Transportation Plan Final Environmental Impact Statement, Grand Teton National Park. This plan (NPS 2006b) addressed the management of transportation-related issues within the park and proposed a multi-use pathway system in the park. Based on the plan, the National Park Service commissioned several studies to evaluate management options for the Moose-Wilson Road and determine the feasibility of a public transit system within the park and to Jackson. The National Park Service will consider the presence and use of the airport in current and future transportation and transit studies and activities.

RELATIONSHIP TO MANAGEMENT ACTIONS OF THE JACKSON HOLE AIRPORT BOARD AND FEDERAL AVIATION ADMINISTRATION

Safety Study. The Jackson Hole Airport runway was constructed to its current dimensions of 6,300 feet long and 150 feet wide in 1959 to serve aircraft that were then used as scheduled passenger carriers, such as the DC-6 and Boeing 307, and emerging aircraft like the DC-8 and Boeing 707. Since it came into service, a number of runway excursions, or incidents in which aircraft ran off the end or side of the runway, have occurred. The runway has never been extended, but paved areas, designated as blast pads, were installed at either end of the runway in the year 2000 to provide an additional paved area for aircraft that are unable to stop at the runway end. Each blast pad is 300 feet long and 150 feet wide. They are not marked as or considered part of the runway, and they cannot be used in calculating takeoff and landing distances.

In February 2008, an Airbus A-320 slid off the right side of the Jackson Hole Airport runway after experiencing a malfunction with its braking system. The aircraft slid sideways for about 250 feet through several feet of packed snow and stopped 116 feet past the end of the runway and about 140 feet from the centerline. The airframe was not substantially damaged, but both engines ingested snow and sustained internal damage. One minor injury occurred among the 119 passengers and 6 crew members while the aircraft was being evacuated using the emergency slides.

Following the February 2008 incident, the National Park Service and Jackson Hole Airport Board agreed that the Board should undertake a comprehensive study of operational safety at the airport. The purpose of this assessment is to identify potential safety issues related to aircraft operations at the airport, and to identify approaches for addressing those issues. The study is underway and is expected to be complete in fall 2010, after opportunities for public involvement. The Board contracted with the firm of Mead & Hunt, Inc. to conduct the study, and the process includes a technical advisory group consisting of representatives from the National Park Service, Federal Aviation Administration, and Wyoming Aeronautics Commission.

The study is looking at a full range of options to address safety. Some of the factors being considered include improvements in runway and approach lighting, aircraft procedures, pilot training and certification, hours of operation of the control tower, navigational aids, runway length and configuration, and emergency response procedures.

The study is not a decision-making process. It is intended to provide the Board and other interested parties with a comprehensive analysis of the airport's safety issues, and to identify options for addressing those issues. If the Board proposes any actions based on the results that are not consistent with or authorized under the existing terms and conditions of the 1983 agreement, before they could be implemented such proposals would require another amendment of the 1983 agreement; compliance with the National Environmental Policy Act, including public participation and the preparation of an environmental assessment or environmental impact statement; and approval by the U.S. Department of the Interior.

Airport Improvement and Development Projects. An airport layout plan and airport forecast are prepared by the Jackson Hole Airport Board and must be approved by the Federal Aviation Administration. The airport layout plan is a concise document that presents how the Board expects the airport to change over a period of about 20 years.

The details of implementing the changes in the airport layout plan are included in the master plan. The most recent update to the Jackson Hole Airport master plan was completed in 1999. The master plan guides the development of airport facilities, provides a blueprint for layout of the airport, and establishes priorities and phasing schedules for improvements and development actions. The master plan typically is updated every 10 to 20 years, or sooner if circumstances warrant. The master plan is effectively revalidated every year by the capital improvement plan.

The 1999 update to the master plan concluded a process that began in 1992, in which the Jackson Hole Airport Board proposed a variety of airport improvements. Over several years, the proposed improvements were modified to involve limited upgrades that primarily were safety-related. Most notable among these were the construction of an air traffic control tower and the addition of 300-foot-long safety areas at each end of the runway, which involved centering (translating) the runway between the safety areas. The safety areas addressed the relatively high number of aircraft involved in runway excursions (that is, overshooting the end of the runway either on landing or during an aborted takeoff). Other aspects of the master plan, including the layout and location of facilities, remained unchanged.

A functional relationship exists between the 1983 agreement and the airport master plan. The agreement frames the terms and conditions under which the Department of the Interior allows the airport to operate within the park, while the master plan provides the specific guidance concerning airport facilities and layout, consistent with the 1983 agreement. The 1983 agreement establishes such parameters as the airport boundaries, development subzone footprint, and runway length. Within these parameters, the master plan provides the specific layout of airport facilities, including those within the development subzone and on the airfield. For example, while the 1983 agreement requires facilities such terminals, hangars, and parking lots to be located within the development subzone, it does not (aside from limiting structure height) specify their configurations, sizes, or locations. The master plan provides those details.

Most improvements authorized under the 1999 master plan update have been completed. In 2004, the terminal was expanded by 12,500 square feet to 33,000 square feet. An air traffic control tower was constructed in 2000, as were the runway safety areas. The parking apron for large aircraft was expanded in 2005, and a new glycol storage and dispensing facility was installed for use in deicing operations.

The Jackson Hole Airport Board is currently implementing another expansion of the airport terminal. Over the past decade, passenger traffic has grown substantially, from about 180,000 enplanements in 2000 to the current level of about 300,000 annual enplanements. As a result, the terminal could not efficiently accommodate either current or reasonably foreseeable future increases in passenger volumes, especially considering the sharp peaks in volume that result from airline scheduling. The current expansion is entirely within the development subzone and within the existing height restriction. It extends the footprint of the existing building to the east, into the area currently used for ground transportation and parking.

Other reasonably foreseeable future projects include replacing hangars, constructing a new hangar, relocating the aircraft rescue and firefighting station (firehouse), and installing a glycol recovery system. There also are plans to improve domestic wastewater management.

In 2006, the Federal Aviation Administration and Grand Teton National Park approved a plan to construct an Air Traffic Control Beacon Interrogator-6 aircraft tracking facility in the northwest part of the airport. The environmental assessment and finding of no significant impact led to the construction of the facility, which includes a tower and antenna about 30 feet tall, with lightning rods to a total height of 39 feet. This facility is within the airport boundary.

All of the proposed actions are consistent with the 1983 agreement. However, some could require an update of the master plan and additional National Environmental Policy Act compliance.

RELATIONSHIP TO PLANNING ACTIONS OF OTHERS

Numerous actions and plans have been implemented and/or developed by local, state, and other federal agencies, and by private entities throughout the area.

Bridger-Teton National Forest Management Plan. This planning effort is currently on hold because of litigation. However, the U.S. Forest Service will be revising this forest management plan in the future. As a federal agency responsible for the management of large areas of nearby land, the National Park Service will be providing input to this planning effort. Issues that may relate to the Jackson Hole Airport agreement extension include the following:

- Decisions made regarding recreation use in the forest could affect local demand for air travel. This particularly is true for skiing and other winter sports, most of which occur on national forest land. For out-of-area users, 90% of travel to and from the Jackson area for winter recreation is by air (RRC Associates 2005; Jackson Hole Chamber of Commerce 2006).
- U.S. Forest Service staff members rely heavily on the airport for transportation. Forest planning assumes the continued availability of this resource.
- The Bridger-Teton National Forest participates in the interagency heliport at the Jackson Hole Airport.

Jackson/Teton County Comprehensive Plan. The comprehensive plan prepared by the Town of Jackson and Teton County (2002) has chapters that address community vision; population, economy, and growth; community character; natural and scenic resources; affordable housing; commercial and resort development; community facilities; transportation; intergovernmental coordination; and agricultural resources. Each section includes issues, goals, implementation strategies, and recommendations.

The Jackson Hole Airport is identified in section 8, Transportation (which was updated in December 31, 2003) as an issue to be analyzed at a future date (page 8-49 of the plan). Specifically, the plan identifies airport issues to be addressed in the future as:

- Supporting continued service at the airport while minimizing environmental and traffic impacts; and
- Management and coordination of ground transportation.

The comprehensive plan currently is being updated. The new plan is expected to be available in 2012. The National Park Service has been working cooperatively with the Town of Jackson and Teton County to participate in the update of the comprehensive plan.

Jackson Hole Airport Resolution. This resolution was adopted by Teton County on September 1, 1987. It is intended to avoid obstructions to aircraft using the Jackson Hole Airport and to protect and promote public health, safety, and welfare. Its purpose section states concern that "an obstruction may affect existing and future instrument approach minimums of Jackson Hole Airport; and that an obstruction may reduce the size of areas available for the landing, takeoff, and maneuvering of aircraft, thus tending to destroy or impair the utility of Jackson Hole Airport and the public investment therein." The resolution addresses height restrictions for trees and structures, and sound reduction measures that should be applied during construction of buildings in areas where the day-night average sound level is 65 A-weighted decibels (dBA) or greater.

Laurance S. Rockefeller Preserve. The Laurance S. Rockefeller Preserve is in the southwestern corner of Grand Teton National Park along the Moose-Wilson Road. It surrounds the southeastern shore of Phelps Lake and is both scenic and wildlife-rich.

The 1,106-acre preserve originally was part of an approximately 3,100-acre John D. Rockefeller family retreat that Laurance Rockefeller inherited. He arranged transfer of 2,000 acres from this property to the park in the 1990s. His gift of the final piece of land was legally conveyed to the National Park Service through Jackson Hole Preserve, Inc. in November 2007. The preserve's interpretive center opened to the public in June 2008.

Laurance S. Rockefeller intended the preserve to serve as a catalyst to inspire appreciation and reverence for the beauty and diversity of the natural world, and to foster individual responsibility for conservation stewardship. The National Park Service is committed to managing the preserve consistent with his vision, and actively seeks to balance public use with preservation of the unique visitor experience at the preserve (NPS 2008).

Southern Teton Area Rapid Transit (START) Teton Pass Commuter Transportation Plan. The START public bus service recommended in 2000 that a year-round commuter bus program should be implemented connecting Jackson, Wyoming and Driggs/Victor, Idaho. After several years of planning, service on this route began in 2007. Routes under consideration include service to the airport. The availability of this service was considered in the cumulative effects analysis.

Expansion of Teton Village and Development of Other Private Land. The Jackson Hole Mountain Resort is operated on U.S. Forest Service land under a special use permit with the Bridger-Teton National Forest. Snake River Associates is developing Teton Village on private land adjoining the resort near the southwest border of Grand Teton National Park. Teton Village facilities currently include hotels, rental homes and condominiums, employee housing, restaurants, and other commercial space. Development expansions were approved by the Teton County Commission in 2005 and 2008, and the resort has several additional development proposals under consideration. Other developments near Jackson and throughout Teton County are in various stages of planning.

Increased residential and commercial development would increase the area's population and the capacity of the community to provide overnight lodging. These changes could increase demand for scheduled passenger and general aviation services at the Jackson Hole Airport. They also could result in increased population in areas outside the park that are overflown by aircraft using the airport, and the number of people outside the park who are affected by aircraft sound.

Expansion of Grand Targhee Resort. The Grand Targhee Resort, on the west side of the Teton Range, is operated under a special use permit with the Caribou-Targhee National Forest. Like other area ski resorts, this facility is considering several development proposals.

The Grand Targhee Resort is equally accessible from the Jackson Hole Airport and Idaho Falls Regional Airport. However, many people arrive in the area via the Jackson Hole Airport and ski both the Grand Targhee and Jackson Hole Mountain Resorts. As a result, the effects of extending the airport agreement would be similar to those described above for the expansion of Teton Village and development of other private land.

ACTIONS CONSIDERED IN DETERMINING CUMULATIVE EFFECTS

Sections 1508.7 and 1508.25 (a)(2) of the Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act require assessment of cumulative effects in the decision-making process for federal actions. Cumulative effects are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions."

As explained in the NPS' guidance on environmental impact analysis (NPS 2001a), the intent of evaluating cumulative effects is to determine the additive impact of the alternative on each resource of concern. It states "It is irrelevant who takes these actions (i.e., they are not confined to NPS or even federal activities), or whether they took place in the past, are taking place in the present, or will take place in the reasonably foreseeable future."

Cumulative effects were determined by combining the effects of each alternative with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other past, ongoing, or reasonably foreseeable future actions at the Jackson Hole Airport, in Grand Teton National Park, and in the surrounding region.

All capital improvements to the airport described under the heading "Existing Facilities at the Jackson Hole Airport" and all of the actions by the National Park Service, Jackson Hole Airport Board, and others that are identified above were considered in conjunction with the alternatives to determine cumulative effects. Other actions considered with the alternatives to extend the airport agreement to determine possible cumulative effects included the following:

Growth of the Town of Jackson and Teton County. Jackson, with an estimated 2008 population of 9,861, is the major population center in Teton County, which had a year 2008 estimated population of 20,376 people (U.S. Census Bureau 2010). The town and county, respectively, had population increases of 84% and 63% between 1990 and 2000, and 14% and 12% between 2000 and 2008.

Operation of the Jackson Hole Airport. The Jackson Hole Airport has become a critical component of the economy of Jackson and Teton County, particularly in the winter when 90% of non-local users of some area ski resorts travel by plane through this airport. The next-closest airport that provides scheduled passenger services is 90 miles away by road, in Idaho Falls.

Continuation of Overflights. Grand Teton National Park is under the flight routes between cities in the Pacific Northwest and cities in the midwest and southeast United States. Overflights also occur by general aviation aircraft based at the Jackson Hole Airport and at other airports throughout the region and nation and, occasionally, by military aircraft. The sound from aircraft overflights is audible throughout the park.

Operation of Grand Teton National Park. Visitation to the park is a major factor in the regional economy, particularly during the peak summer months of June through August, when park visitation can exceed 600,000 visitors per month. Estimates place the number of park visitors who arrive by airplane through the Jackson Hole Airport at between 6% and 12% of total annual park visitation (RRC Associates 2005; Littlejohn 1998; Braak *et al*. 2009).

Nearby Presence of Yellowstone National Park. Yellowstone National Park typically draws about 3 million visitors annually to northwest Wyoming (NPS 2005a, 2010). This has several effects relating to the Jackson Hole Airport agreement, such as generating demand in the area for airport services, and increasing the numbers of visitors who are seeking an experience of spectacular mountain views associated with quiet natural soundscapes in Grand Teton National Park.

Operation of National Forests. The Bridger-Teton National Forest is adjacent to Grand Teton National Park on the east and south, and the Caribou-Targhee National Forest adjoins the park on the west. Other national forests in the area include the Gallatin and Custer National Forests in Montana, Beaverhead-Deerlodge National Forest in Idaho, and Shoshone National Forest in Wyoming. Together, they and the national parks support about 16 million recreational visits annually, with many visitors spending time in two or more of these units during their visit to the area (Greater Yellowstone Coordinating Committee 2006). There is extensive coordination between the National Park Service, U.S. Forest Service, and other federal land managers throughout the region.

Operation of Ski Resorts. Three ski resorts operate in Teton County. They include Snow King Resort, Jackson Hole Mountain Resort, and Grand Targhee Resort. White Pine Ski Area is in adjacent Sublette County. Each winter, the Teton County resorts collectively provide 550,000 to 600,000 skier days to mostly nonresident skiers, providing a major boost during what otherwise would be a low-use period for the area's tourism-related industries. An estimated 90% of these visitors fly into the area (RRC Associates 2005; Jackson Hole Chamber of Commerce 2006).

Construction and Operation of Major Highways. Topography resulted in the convergence of several major highways in the area of Jackson and the east side of Grand Teton National Park. These include U.S. Highways 26, 89, 191, and 287. The sound produced by automobiles and, particularly, heavy trucks and motorcycles, can carry several miles in areas of flat topography and contributes to the cumulative adverse effect on the natural soundscape of the park.

Helibase Operations. The National Park Service operates an interagency helibase at the Jackson Hole Airport. The 5-acre helibase includes a 2,500-square-foot office building, three helicopter landing pads, and parking. Future plans include the addition of a 5,000-square-foot hangar that will be within the helibase boundary and will not exceed the airport height restriction.

The helibase is critical to the operations of the National Park Service and U.S. Forest Service. It is primarily a summer seasonal operation that provides safety and resource management functions at Grand Teton National Park and nearby public lands. These functions include wildland fire suppression, search and rescue missions, and emergency medical services. The operation of helicopters from the helibase contributes to the cumulative adverse effect on the natural soundscape of the park.

Chapter 2
Alternatives

This chapter describes two alternatives regarding the 1983 agreement for the Jackson Hole Airport. It also identifies alternatives or actions eliminated from further consideration. The preferred alternative and environmentally preferred alternative are identified. The important features of the alternatives, their effectiveness in meeting goals of the proposed action, and a summary of the effects of the alternatives are provided.

FORMULATION OF ALTERNATIVES

ALTERNATIVES DEVELOPMENT PROCESS

Sections 1502.14 and 1508.25 of the Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act require that the alternative of no action be included in all environmental evaluations. Accordingly, the National Park Service developed Alternative 1, the no action alternative, under which the 1983 agreement would stay in effect until 2033, and then expire.

Alternative 2 is the preferred alternative. The proposal made by the Jackson Hole Airport Board was to extend the authorized term of the 1983 agreement by 20 years in the form of two additional 10-year options, with no other changes. The April 25, 2005 letter from the Board to the superintendent of Grand Teton National Park that describes their proposal is included in Appendix A. In response to comments received on the draft environmental impact statement, the preferred alternative has been revised to strengthen to the agreement's commitment to reduce impacts from the airport to the lowest levels practicable, consistent with safe and efficient operation and with applicable laws, regulations, and contractual requirements.

ALTERNATIVES OR ACTIONS ELIMINATED FROM FURTHER STUDY

Several alternatives or actions suggested during scoping by other agencies or the public were not examined in this environmental impact statement. Consistent with section 1502.14 of the Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act, this section identifies those alternatives and actions, and presents the reasons why they were not considered further.

Evaluate an Alternative that Would Allow an Increase in the Height of Airport Buildings. The 1983 agreement limits the height of buildings at the airport to an elevation not greater than the height of buildings that were present in 1983, agreed to be 6,437 feet above mean sea level. It was suggested that increasing the 1983 agreement's height restriction for buildings by 6 feet would enhance the airport's operational flexibility.

Response: Jackson Hole Airport staff examined the potential for, and benefits of, increasing the height of existing buildings and/or constructing new buildings to a height of 6,443 feet above mean sea level instead of the existing ceiling. Staff determined that such an increase in the allowable height of buildings would provide little or no operational benefit. Therefore, this change was eliminated from further consideration.

Evaluate an Alternative that Would Close the Airport and Develop Air Service Elsewhere. Suggestions ranged from phased reductions to immediate termination of existing operations at the Jackson Hole Airport. Suggested locations for airport facilities that could be created or expanded to handle air service for the area included Afton, Alpine, Casper, Daniel, Dubois, Driggs, Idaho Falls, Salt Lake City, and Star Valley. A related suggestion included exploring a land swap for a replacement airport site on private in-holdings on Bureau of Land Management or other federal land.

Response: The 1983 agreement between the Department of the Interior and the Jackson Hole Airport Board authorizes the airport to operate within Grand Teton National Park until April 27, 2033. The agreement, as amended in 1985, may be terminated for default prior to that time, but not without giving the Board an opportunity for a hearing on the merits of the alleged default and without providing a reasonable period within which to cure the default. Absent those conditions, the Department of the Interior may not simply terminate the agreement earlier than its 2033 expiration date.

The no action alternative in this environmental impact statement would result in closure and removal of the airport in 2033.

During the 1970s and early 1980s, Jackson Hole Preserve and the Federal Aviation Administration investigated the possibility of relocating the airport to an alternate site. Although many sites were studied, none was considered both feasible and prudent as a replacement for the existing Jackson Hole Airport. A site known as Webb Draw, near Daniel, Wyoming, was investigated most closely. The Federal Aviation Administration concluded that although it was technically feasible to build an airport at the site, airport relocation was not prudent, given the practical and political ramifications (Federal Aviation Administration 1982).

In addition, an alternative that would close the airport and develop air service elsewhere does not meet the purpose and need of the proposal that is being evaluated in this environmental impact statement.

Improve Transportation from Other Airports. These suggestions presumed that operations at the Jackson Hole Airport would be severely limited or terminated and that another airport in the region would be created or expanded to provide replacement air service. Suggestions included enlarging the Snake River Canyon road (U.S. Highway 26) to create a four-lane highway, and building concrete avalanche snow sheds on Teton Pass to keep Wyoming Highway 22 open throughout the winter to accommodate travel from candidate Idaho airport sites to Jackson. It also was suggested that a shuttle bus service should be provided from a new or expanded airport in another community to Jackson.

Response: The improvement of highways and other transportation systems is managed and largely funded by the states and the U.S. Department of Transportation and is outside the responsibility of the National Park Service. Independent of actions associated with the Jackson Hole Airport, the Southern Teton Area Rapid Transit (START) already provides bus service to some of the nearby communities that have been suggested as locations for a replacement airport.

Evaluate an Alternative that Includes Additional Requirements to Further Reduce and Mitigate the Effects of the Airport. Commenters suggested that any airport agreement should require the Jackson Hole Airport Board to further reduce the impacts of the airport on Grand Teton National Park. Many comments were non-specific with regard to the types of mitigation or other requirements that should be imposed. Others suggested specific measures, such as limits the number of operations or enplanements, limits or prohibitions on types of aircraft, restrictions on use of the airspace or aircraft operational procedures, restrictions on the development footprint or future development, or revisions to the noise abatement plan or noise exposure limits in the 1983 agreement.

Response: The draft environmental impact statement included two alternatives, including the no action alternative, under which the term of the agreement would not be extended, and the preferred, which would extend the term by 20 years. In response to comments received on the draft environmental impact statement, the National Park Service revised the preferred alternative to strengthen the agreement's commitment to reduce the impacts of the airport to the lowest levels practicable. The rationale for responding to comments by revising the preferred alternative, rather than including one or more additional alternatives, is set forth below.

The 1983 agreement was entered into, among other reasons, "to provide a mechanism to facilitate the qualification for Federal Aviation Administration grants-in-aid." When airport owners or sponsors, such as the Jackson Hole Airport Board, accept funds from the airport financial assistance programs of the Federal Aviation Administration, they must agree to obligations (assurances). These obligations require the recipients to maintain and operate their facilities safely and efficiently and in accordance with specified conditions. The assurances appear either in the application for federal assistance, where they become part of the final grant offer, or in restrictive covenants to property deeds. The duration of these obligations depends on the type of recipient, the useful life of the facility being developed, and other conditions stipulated in the assurances. The terms of the 1983 agreement were crafted to enable the Board to comply with these obligations.

None of the terms and conditions in the 1983 agreement precludes the Board from taking actions to reduce the impacts of the airport on the park. However, in doing so, the Board must comply with all applicable laws, regulations, and contractual requirements. Some of the features governed by these laws and regulations include airport noise compatibility planning, noise and access restrictions, and funding procedures and requirements. For example:

- By law, the Board must make the airport available as a public facility, open to all classes and types of aviation users.
- The Board may not impose new noise or access restrictions without submitting them to the Federal Aviation Administration for review and approval in accordance with a process prescribed by the Airport Noise and Capacity Act of 1990 and its implementing regulations.

Even when changes "may" be made, experience has demonstrated that the approval process makes changes unlikely. For example, in the 20 years since the enactment of Airport Noise and Capacity Act, no airport in the nation has been successful in implementing noise or access restrictions for Stage 3 aircraft.

Because of these types of limitations, the National Park Service does not believe that an alternative that required the Board to take many of the types of actions suggested by the commenters would be viable. Instead, the National Park Service revised the preferred alternative to require the Board to work within the framework of existing laws and regulations to further reduce the impacts of the airport on the park.

Limit Construction in the Development Subzone. It was suggested that airport growth could be limited by not allowing any new facilities in the development subzone, and not allowing any existing facilities to be replaced or expanded. Specific comments opposed replacing the hangars, expanding the parking areas for aircraft and automobiles, providing a taller terminal for modern ramps to scheduled passenger service aircraft, constructing additional buildings, expanding rental car facilities, increasing ramp lighting, or increasing fuel storage.

Response: These types of limits are not an alternative, individually or collectively, because they do not fulfill the purpose and need for the proposed action. Rather, they are potential mitigation measure that commenters think would reduce the effects of the airport.

Section 7(a) of the agreement authorizes the Jackson Hole Airport Board to "construct or install upon the lands included in this agreement such buildings, structures, or other improvements and build or construct such roads as are necessary and desirable for the operations permitted hereunder in the development subzone." So long as the Board conforms to limitations specified in other sections of the 1983 agreement, it may develop or redevelop the land within the 28.5-acre development subzone as it deems appropriate.

Impose Additional Restrictions on the Jackson Hole Airport Board. Some commenters suggested that the National Park Service should unilaterally impose additional requirements or conditions on the Jackson Hole Airport Board regarding facilities or operations at the airport.

Response: Such requirements do not represent alternatives because they do not fulfill the purpose and need for the proposed action. Rather, they are potential mitigation measure that commenters think would reduce the effects of the airport.

The April 27, 1983 document clearly states that it is an *agreement* between the Jackson Hole Airport Board and the U.S. Department of the Interior. Any changes to the agreement must be negotiated between the parties. The National Park Service cannot unilaterally change the terms and conditions of the agreement without the concurrence of the Board.

Address Regional Carrying Capacity. Because the airport does not substantially affect the carrying capacity of Grand Teton National Park, all of these comments were related to airport carrying capacity or the consideration of regional carrying capacity. Specifically, they mentioned analyzing the area's ability to support the human population without deterioration to the environment and the quality of life that Jackson residents and visitors have come to expect.

Response: Carrying capacity of the airport is addressed in this environmental impact statement in terms of opportunities for changes at the airport under the existing agreement, such as expansion or replacement of buildings, alternate uses of the current parking areas, and modifications to hangars. Indirect effects of the action on the maintenance of natural and social conditions outside the park and quality of life are considered for multiple impact topics, including dark skies, wildlife, socioeconomics, and transportation.

Maintain Development Subzone and Airport Boundaries. Commenters suggested restrictions on future expansions of the airport. Specifically, they said the National Park Service should not allow any facilities outside the existing development subzone or airport boundary.

Response: The boundaries of the development subzone and airport are defined in the 1983 agreement. These boundaries would not be changed by either alternative. The current limitations on the installation of facilities outside these boundaries would continue under both alternatives.

Future changes to the development subzone, changes to the airport boundaries, or other changes to the agreement related to the development of facilities could occur only with an amendment to the 1983 agreement, supported by an appropriate National Environmental Policy Act process. Any proposal to change boundaries or to install facilities outside the development subzone would require the preparation of an action-specific National Environmental Policy Act compliance document. This would include notification and opportunities for comment by the public and other agencies, consistent with Council on Environmental Quality (1978) requirements and the procedures in *Director's Order #12 and Handbook: Conservation Planning, Environmental Impact Analysis, and Decision Making* (NPS 2001a).

Change Sound Management. Suggestions for managing aircraft sound included:

- Change the existing noise limits or noise levels.
- Reduce or eliminate nighttime takeoffs and landings at the airport, except for emergency services.
- Prohibit helicopter and small-plane tours of Grand Teton National Park.
- Update the existing noise management plan. Suggestions from commenters included implementing procedures for monitoring and managing noise levels; a requirement that noise abatement procedures apply to all aircraft, not just the commercial aircraft covered in the current plan; management of noise as a cumulative "noise bucket" that is compared to a "noise bucket capacity" that includes all scheduled passenger service and general aviation flights; better controls on directions of takeoffs and landings; and a ban on aircraft approaches over the park through the contracts airlines sign allowing them to do business at the Jackson Hole Airport.

Response: Sections 4(f) and 4(g) of the existing agreement established noise standards for the operation of the Jackson Hole Airport. Modifications to these sections of the agreement are outside the scope of the alternatives.

The Jackson Hole Airport Board has adopted a voluntary curfew between the hours of 11:30 P.M. and 6:00 A.M. for landing and 10:00 P.M. and 6:00 A.M. for takeoff. Under the Airport Noise and Capacity Act and its implementing regulations, the Board is prohibited from adopting a mandatory curfew. However, to improve compliance with the voluntary curfew, the Board records information on aircraft that violate the curfew and notifies their owners by letter, reminding them of the reasons for the curfew and requesting them to refrain from further violations.

The Airport Noise and Capacity Act and its implementing regulations also prohibit any reduction in existing noise limits without Federal Aviation Administration approval.

With regard to air tours, section 4(h) of the 1983 agreement already prohibits the origination from the Jackson Hole Airport of any commercial scenic or charter flights over the noise-sensitive areas of the park. In addition, there are no known, regularly scheduled, air tour operations over Grand Teton National Park from any other airports.

If an operator wanted to conduct such tours from another airport, the Federal Aviation Administration and National Park Service first would have to implement measures to conform to the requirements of the National Parks Air Tour Management Act of 2000. These would include:

- Establishing an air tour management plan would include holding public meetings and complying with the National Environmental Policy Act and Council on Environmental Quality (1978) regulations for its implementation. (For purposes of complying with the regulations, the Federal Aviation Administration would be the lead agency and the National Park Service would be a cooperating agency.) The air tour management plan would include acceptable and effective measures to mitigate or prevent the significant adverse impacts, if any, of commercial air tour operations on the natural and cultural resources and visitor experiences of the park.

- Requiring applications from candidate commercial air tour operators for authority to conduct operations over park lands in conformance with the air tour management plan. The National Park Service would be involved in approving or disapproving applications.

The Federal Aviation Administration and National Park Service have not received any requests for commercial air tour operations over Grand Teton National Park.

The Jackson Hole Airport Revised Noise Abatement Plan (provided in Appendix D) has not been formally updated since 1985. However, the Jackson Hole Airport Board continuously implements measures to manage and reduce sound, consistent with the requirement in section 4(e) of the 1983 agreement and in accordance with the Part 150 Airport Noise Compatibility Planning requirements of the Federal Aviation Administration's Airports Environmental Program. For example:

- The Board includes language in all leases with scheduled passenger service airlines that requires airlines to ensure that their pilots are made aware of the sound abatement rules and procedures, and to take appropriate action against employees for operations contrary to the noise control plan where there are no valid reason for noncompliance. Similar language is included in the airport's contract with the fixed-base operator, Jackson Hole Aviation. In addition, the contract with Jackson Hole Aviation requires them to insert language into all subcontracts intended to ensure compliance with the noise abatement plan, and to distribute copies of the noise abatement plan to departing pilots.
- On June 28, 2004, the Jackson Hole Airport began enforcing a rule prohibiting the operation of all Stage 2 aircraft. The rule affects a relatively small number of general aviation jet aircraft that contributed disproportionately to impacts on the park's soundscape. Violation of the rule may result in a $750 fine and mandatory court appearance under the Town of Jackson Municipal Code.
- The airport has developed a good working relationship with personnel the control tower, which is operated under contract with the Federal Aviation Administration. The tower provides information to pilots by radio regarding the noise abatement procedures.

In accordance with section 4(e) of the 1983 agreement, the Jackson Hole Airport Board must review and amend the noise control plan for the Jackson Hole Airport "to incorporate new prudent and feasible technological advances which would allow further reduction in sound impacts on Grand Teton National Park" regardless of the alternative selected for extending the agreement.

ALTERNATIVE 1: NO ACTION / CONTINUE CURRENT MANAGEMENT

SUMMARY

Alternative 1 would not include any administrative or other type of action. No extension would be granted in the duration of the April 27, 1983 agreement. It also would not involve construction or development of new facilities, proposals for which would be addressed under separate compliance reviews.

- Because of forward-looking requirements, the Jackson Hole Airport Board's five-year capital improvement planning would begin to be impacted well before 2013 (Morgan 2006).
- On April 27, 2013, the Jackson Hole Airport Board would lose its eligibility for Federal Aviation Administration grant funding. This would eliminate all federal funding available for acquisition, repair, and replacement of airport infrastructure.
- On April 27, 2033, the agreement would terminate and the airport would close. Within six months, the Jackson Hole Airport Board would be required to remove the terminal, restore its site to as nearly a natural condition as possible, and otherwise meet the provisions of section 7(d) of the agreement.
- After that date, the National Park Service would remove any remaining facilities and manage the airport site as a part of Grand Teton National Park.

ELEMENTS OF ALTERNATIVE 1

To be eligible for Federal Aviation Administration grant funding, the Jackson Hole Airport Board must have a "satisfactory property interest" in the underlying land. In situations where an airport authority does not own the land, a satisfactory property interest is defined as an agreement or lease term of not less than 20 years (Title 14, Part 152, section 3 of the *Code of Federal Regulations*). This provision is applicable to the Jackson Hole airport, which is on land owned by the United States. Accordingly, unless the term of the 1983 agreement is extended, the Jackson Hole Airport Board will lose its eligibility for Federal Aviation Administration grant funding in the year 2013.

The Jackson Hole Airport Board is required to have a forward-looking, five-year capital improvement plan for Federal Aviation Administration grant funding. Under this plan, rehabilitation of the taxiway was completed in 2008, and upcoming projects include rehabilitation of the runway pavement and upgrade of its electrical system, purchase of plow trucks, and expansion of the passenger terminal. Without an airport agreement term extension, this planning would be adversely affected before the funding-loss trigger date of April 28, 2013 (Morgan 2006). This would occur because of the long lead-time between funding requests and actual funding.

Projects recently funded by Federal Aviation Administration grants at the Jackson Hole Airport included runway rebuilding and rehabilitation, the acquisition of snowplows and fire trucks, airport fencing, and terminal improvements (Morgan 2006). These funds also are a primary component for developing and implementing airport security provisions. If Federal Aviation Administration grant funding was no longer available, the amount of money that could be used by the Jackson Hole Airport Board for these purposes would be reduced by more than 70%.

Every airport in the United States that provides scheduled passenger service receives Federal Aviation Administration grant funding (Morgan 2006). Without the improvements paid for by these grants, the Jackson Hole Airport Board would have difficulty maintaining the airport's Part 139 certification to support scheduled passenger aviation. Without this certification, scheduled passenger service airlines would terminate their service to the airport. This condition would occur sometime after the airport lost its funding eligibility, but the exact timeframe is difficult to predict because of the many variables that could affect the Part 139 certification process. Potentially, such a loss of certification could occur within a few years of the present, or as much as a decade or more later. However, for consistency, the year of 2015 is used in all of the impact analyses. The period between now and 2015 is referred to in this environmental impact statement as the transition period.

From 2015 until April 27, 2033, the Jackson Hole Airport would continue operations under the existing agreement. General aviation would be the primary use, and pilots would rely on their own judgment regarding whether they considered the airport safe. This period is referred to in this environmental impact statement as the general aviation period. During this time:

- The Jackson Hole Airport Board would continue to receive funding from airport use fees and, possibly, from the community, state of Wyoming, and/or other non-federal entities that were interested in maintaining the operability of the airport until its mandated closure date. The Board would spend that income to support continuing operations.
- There would not be any passenger enplanements, which by definition are associated exclusively with scheduled passenger service.
- Compared to current conditions, general aviation use would increase, provided that pilots perceived that use of the airport was safe. However, without funding from the Federal Aviation Administration, damage to or deterioration of the runway eventually could create a situation that general aviation pilots could judge as unsafe. In that event, general aviation use of the Jackson Hole Airport would decrease or, potentially, end.

Between now and 2033, the Jackson Hole Airport Board would have to continue to meet all of the requirements of the 1983 agreement. In addition, it would continue complying with all federal and Wyoming laws and regulations. Examples include continued compliance with the airport's National Pollutant Discharge Elimination System permit requirements, conformance of the domestic wastewater treatment system with state requirements, and continued management of hazardous materials by the fixed-base operator in conformance with the Resource Conservation and Recovery Act.

Throughout this period, the Jackson Hole Airport Board could continue to install improvements in the development subzone, consistent with sections 7 and 9 of the 1983 agreement, subject to the Department of the Interior notification and review provisions in these sections. Development would have to conform to all agreement provisions, such as the height restriction and development subzone boundaries.

After April 27, 2033, the removal provisions in section 7(d) of the 1983 agreement would become effective. During the following six-month period, the Board would have to remove the terminal and restore its site to as nearly a natural condition as possible. Consistent with the Resource Conservation and Recovery Act, the Board or other responsible party (such as the fixed-base operator) also would be responsible for removing any hazardous materials remaining onsite, and cleaning up any contamination of soil or ground water that may have resulted from airport operations. Thereafter, management of the 533-acre airport property, 4.37-acre access road alignment, and all remaining buildings, structures, or improvements would be return to the National Park Service.

The Jackson Hole Airport Board is not required by the 1983 agreement to remove and restore the runway or any infrastructure sites other than the terminal. Therefore, any buildings, structures, or improvements that did not have salvage value probably would be left in place by the Board. The Board would have to restore the sites of features that were salvaged to as nearly a natural condition as possible.

After the property reverted to NPS management, all remaining airport features, such as pavement, buildings, and fencing, would be removed. The site would be restored to native vegetation, which would consist primarily of an overstory of sagebrush and an understory of grasses and forbs.

The interagency helibase was completed at the Jackson Hole Airport in May 2004. Under Alternative 1, as part of closing the airport in 2033, the National Park Service would remove the helibase and restore its area with the rest of the airport site. A new interagency helibase would be established on or near already-developed land in the region, but not necessarily within Grand Teton National Park.

ALTERNATIVE 2: PREFERRED ALTERNATIVE

SUMMARY

Alternative 2 is the preferred alternative, and would amend the text of the 1983 agreement to provide the Jackson Hole Airport Board with options for two additional 10-year terms. Provided that the Board has complied with the terms and conditions of the agreement, the Board could exercise these options in 2013 and in 2023, extending the term of the agreement each time in 10-year increments.

- The first additional option could be exercised by the Board within 120 days before April 27, 2013, extending the term of the agreement from April 27, 2033 to April 27, 2043.
- The second additional option could be exercised by the Board within 120 days before April 27, 2023, extending the term of the agreement from April 27, 2043 to April 27, 2053.

The proposed amendment would also add language to the agreement strengthening the requirements of the Jackson Hole Airport Board to work in good faith to further reduce and mitigate the impacts of the airport on the park to the lowest practicable level, consistent with the safe and efficient operation of the airport and with applicable laws, regulations, and existing contractual obligations. In addition, the agreement would be revised to require the Board to prepare a biennial report of its operations and accomplishments, including efforts to mitigate its impacts, and to periodically review the terms of the agreement with the National Park Service at least every five years. The purpose of such reviews would be to determine whether any changes to the terms and conditions should be made.

Alternative 2 would be implemented by enacting Amendment No. 3 to the April 27, 1983 agreement. This amendment would be signed by representatives of the Jackson Hole Airport Board and the U.S. Department of the Interior. A draft of Amendment No. 3 is included as Appendix F.

ELEMENTS OF ALTERNATIVE 2

Alternative 2:

- Extends the total authorized term of the agreement by 20 years;
- Makes certain revisions to the text for clarification purposes;
- Adds a provision requiring the Board and the National Park Service to meet periodically, but not less than every 5 years, to (a) review any changed circumstances, and discuss whether any further amendments to the agreement would result in better ensuring the airport's compatibility with the purposes and values of the park, or improve the safety and efficiency of park and airport operations, and (b) discuss and identify mitigation measures that may then be available to comply with the requirements of the agreement.

- Adds a provision to the agreement that would require the Board to work in good faith to seek to further reduce the impacts of the airport. The effect of this provision would be to ensure that even if the Board has complied with the requirements of the agreement, including those pertaining to noise, that efforts are made to further reduce the impacts to as low a level as is practicable, provided that the measures are reasonable, consistent with the safe and efficient operation of the airport, and with applicable law, regulation, and existing contractual requirements.

Alternative 2 would provide conditions that would allow scheduled passenger service at the Jackson Hole Airport to continue until 2033. However, without yet another extension of the agreement by that time, the Board would have fewer than 20 years remaining on its authorized term, which would expire in 2053. As a result, without further action, the conditions that would develop under Alternative 2 beyond 2033 would be similar to those described for the general aviation period under Alternative 1.

MITIGATION MEASURES

Existing Mitigation Measures

The 1983 agreement included a number of provisions and requirements intended to ensure that the airport would remain compatible with the purposes of the park. Measures taken by the Jackson Hole Airport Board and others that contribute to meeting these requirements are identified below. Under the Preferred Alternative (Alternative 2), these requirements and measures already taken to mitigate the effects of the airport would remain in effect through the extended term of the agreement, unless superseded by more stringent requirements. Under Alternative 1, these measures would remain in effect until 2033 unless circumstances made them no longer applicable.

- The agreement includes both single-event and cumulative noise requirements. Specifically, the agreement requires that the 55 DNL contour remain outside of the noise-sensitive areas of the park, and that the 45 DNL contour not extend beyond a specified restriction line.
- No aircraft is permitted to operate at the Jackson Hole Airport if it has a single-event noise level exceeding 92 dBA on approach, as determined by Federal Aviation Administration Circular 36-3B or a specified equivalent certification procedure.
- The Board's noise abatement plan establishes a limit on the number of commercial jet aircraft operations of 6.5 average daily departures of the Boeing 737-200 aircraft. A greater number of departures is allowed only by substituting quieter aircraft based on a noise equivalency factor.
- The Board prohibits the operation of all Stage 2 aircraft under 75,000 pounds. Heavier Stage 2 aircraft are prohibited by federal law.
- The Board has adopted a voluntary curfew on night flights, with a system for notifying owners of aircraft that violate the curfew by letter and requesting them to refrain from further violations. The curfew, which applies to all scheduled passenger service and general aviation aircraft, is between the hours of 11:30 p.m. and 6:00 a.m. for landing and 10:00 p.m. and 6:00 a.m. for takeoff. The Board also includes a curfew provision in its airline contracts that prohibits jet arrivals and departures between 9:30 p.m. and 7:00 a.m. The curfews have been successful and only a few curfew violations occur. Overflights of the park below 3,000 above ground level are also discouraged.
- The Board has made the airport's noise abatement procedures widely available to all pilots and aircraft operators through a variety of means, including an insert for pilot notebooks, the airport

website, air traffic control broadcasts, aeronautical publications, magazines, and other materials typically used by pilots for flight planning. The procedures indicate that Runway 01 (from the south) is the preferred arrival runway and Runway 19 (to the south) is the preferred departure runway, and request that all pilots stay east of the Snake River and/or U.S. Highway 26/89/191. In addition, control tower personnel inform pilots of the noise abatement procedures and encourage their compliance.

- The Board includes language in all leases with scheduled passenger service airlines requiring them to ensure that their pilots are made aware of the noise abatement rules and procedures and to take appropriate action against employees for operations contrary to the noise control plan where there exists no valid reason for noncompliance. Similar language in the airport's contract with the fixed-base operator requires the fixed-base operator to insert language into all subcontracts to ensure noise abatement plan compliance, and requiring them to distribute copies of the noise abatement plan to pilots departing the airport.
- As required by the agreement, the Board inserts in all contracts a prohibition on the origination from the airport of scenic, charter, and training flights over noise sensitive areas of the park.
- An air traffic control tower was constructed in 2000. The tower is at the center of a Class D airspace "cylinder" extending to a radius of 5 miles and 3,000 feet above ground. Within this airspace, all aircraft must be in communication with the tower and operate under the direction of controllers. The presence of the tower facilitates the safe and efficient use of the airspace and reduces overflights of the park below 3,000 feet above ground level.
- The Federal Aviation Administration's Air Traffic Control Beacon Interrogator-6 aircraft tracking system became operational in 2009, and provides air traffic controllers with the ability to track aircraft in the Jackson Hole area. The BI-6 has the potential to more efficiently move aircraft in and out of the airspace and thereby decrease noise impacts on the park.
- The Board established a noise complaint system to record all noise complaints from the public. The Board investigates complaints, and persons filing complaints are given available information regarding the cause of their complaint, any reasons given for the violation, and action taken.
- The Board has adopted a comprehensive noise monitoring program that documents the level of compliance with the terms of the 1983 agreement. In 2003, the Board upgraded its noise monitoring capabilities and installed a permanent system that gathers data continuously. This system has subsequently been integrated to collect data from the BI-6 and correlate it with specific noise events. The system provides the Board with a highly accurate database of how the park is affected by aircraft noise and is/will be useful in identifying additional measures that may be effective in reducing aircraft noise.
- In accordance with the agreement, the Board has ensured that all buildings are compatible in architectural style and appearance with structures that were present in 1983, and that they do not exceed the specified height. The low height of the buildings, muted colors that are compatible with the natural surroundings, and vegetative screening and planting have ensured that the airport is visually subordinate to the landscape character.

With respect to noise, the Board has complied with the terms of the agreement, and with the objectives of the noise abatement plan, which are to ensure that aircraft noise exposure will remain compatible with the purposes of the park and will result in no significant increase in cumulative or single-event noise impacts on noise sensitive areas of the park. In fact, the DNL noise contours have actually decreased in size since the first Federal Aviation Regulations Part 150 study in 1984. The most important reason for this decrease is the introduction of quieter Stage 3 aircraft, and the prohibition of noisier Stage 2 aircraft. Chapter 3 includes a more thorough discussion of this topic.

Options for Mitigation Measures to Further Reduce Impacts of the Airport

As described above, Alternative 2 includes a number of changes to the existing text of the 1983 agreement, the net effect of which is to strengthen the requirements for the Board to undertake efforts to further reduce the adverse effects of the airport on the park. These additional changes are beyond compliance with the existing noise and other requirements of the agreement. Alternative 2 would not alter the existing single-event and cumulative noise requirements of the agreement, but would require the Board, in cooperation with the National Park Service, to identify, develop, and implement additional measures to reduce noise and other environmental impacts to the lowest practicable levels which are reasonable, consistent with the safe and efficient operation of the airport, and with applicable law, regulation, and existing contractual obligations.

One of the primary purposes of the agreement, as stated on its first page, is "…to provide a mechanism to facilitate the qualification for Federal Aviation Administration grants-in-aid…" The agreement also deems that the Board is the operator of the airport and is solely responsible for its operation, management, utilization, and maintenance. It further specifies that airport operations must comply with regulations of the Federal Aviation Administration.

When airport owners or sponsors, such as the Jackson Hole Airport Board, accept funds from Federal Aviation Administration -administered airport financial assistance programs, federal law requires that they agree to certain obligations (assurances). These obligations require the recipients to maintain and operate their facilities safely and efficiently and in accordance with specified conditions. The assurances appear either in the application for federal assistance and become part of the final grant offer, or in restrictive covenants to property deeds. The duration of these obligations depends on the type of recipient, the useful life of the facility being developed, and other conditions stipulated in the assurances.

In the case of the Jackson Hole Airport, a 20-year extension to the authorized term of the agreement is necessary to ensure that the Board complies with Federal Aviation Administration grant assurances regarding a satisfactory interest in the property on which the airport is situated. However, there are numerous other obligations with which the Board must comply. These are equally important in ensuring its eligibility for funding. Actions contrary to any of these obligations would potentially place the Board in non-compliance with Federal Aviation Administration grant assurances and even federal law. Noncompliance would disqualify the Board from receiving grants, and could result in an order requiring the Board to repay grant funds already received. Such measures would be contrary to the purpose and need for the proposed action.

Furthermore, the Board must comply with all applicable laws and regulations, and in this regard specifically with those that pertain to airport noise compatibility planning and noise and access restrictions. These requirements are discussed in more detail below under the heading "Noise and Access Restrictions."

The Jackson Hole Airport Board and National Park Service have established a working group to address the environmental effects of the airport on the park and to identify and develop mitigation measures to reduce these effects. The group is composed of two members of the Jackson Hole Airport Board, the airport director, the park superintendent, and key staff from the airport and the park. The members of this group already work together closely on a wide a variety of matters related to the airport. Nonetheless, the group will continue meeting together several times each year for the specific purpose of addressing environmental effects and mitigation measures.

The Jackson Hole Airport Board and National Park Service have developed a preliminary list of potential mitigation measures that may be helpful in reducing noise and other environmental impacts of the airport on the park. These measures have not yet been fully evaluated in terms of their effectiveness, costs and benefits, ease of implementation, availability of funding sources, and consistency with applicable laws, regulations, executive orders, and other mandates.

Some of the measures can and/or will be implemented almost immediately with little or no additional funding requirements or approvals; others may require substantial new funding, or require lengthy planning and/or review and approval processes. Some of the measures would require actions by other agencies, such as the Federal Aviation Administration. Some of the actions may prove to be impractical or have little effect. The National Park Service and Jackson Hole Airport Board will further evaluate these measures, and as required by the 1983 agreement, the Board will update the existing noise abatement plan, through a Federal Aviation Regulations Part 150 process to study new measures to mitigate and reduce the effects of the airport on the park. The Federal Aviation Regulations Part 150 process will include opportunities for public involvement.

The potential mitigation measures identified thus far fall into five general categories –

- Data collection, planning, and analysis;
- Improved technology and new procedures;
- Education and voluntary compliance;
- Noise and access restrictions;
- Measures to address non-noise related environmental impacts.

Data Collection, Planning, and Analysis

1. Revise Noise Abatement Plan Based on Federal Aviation Regulations Part 150 Study. The 1983 agreement includes a provision that requires the Board to review and amend its noise abatement plan to incorporate new prudent and feasible technological advances which would allow further reduction in noise impacts on the park. The current plan has been in effect since 1985. Although the plan itself has not been revised, the Board has complied with the intent of that provision by updating the Federal Aviation Regulations 150 study at intervals between 1985 and 2003, and implementing a variety of noise mitigation measures, including technological advances, to reduce noise impacts on the park. Under either alternative, the Board will undertake an airport noise compatibility study (Part 150 study) update to serve as the basis for revising the existing noise abatement plan.

   The primary program under which the Federal Aviation Administration supports local airport noise compatibility planning and projects is contained within Title 14 *Code of Federal Regulations* 150 (Part 150). These regulations were promulgated to implement the Aviation Safety and Noise Abatement Act of 1979 (ASNA), and provide criteria for a voluntary program that allows airport operators to prepare noise exposure maps and recommend measures in a noise compatibility program to reduce noise and non-compatible land uses. Airport operators may submit noise compatibility programs for approval to the Federal Aviation Administration, and may be eligible for Airport Improvement Program funding to implement noise abatement projects. Part 150 studies must comply with the criteria established in the regulations. The existing noise abatement plan for the Jackson Hole Airport was developed pursuant to a Part 150 study that was completed in 1985, and which has been updated periodically.

   A Part 150 study is an in-depth process that involves working with the community and other stakeholders to address airport noise issues. These studies require varying amounts of time to complete, depending on the types of issues and their complexity, and result in the development of measures that may be available to reduce airport noise impacts. The Part 150 study is conducted in accordance with Federal Aviation Administration criteria and requirements. To be eligible for Federal Aviation Administration noise abatement funding, any measures adopted must first be approved by the Federal Aviation Administration.

2. Prepare Soundscape Management Plan. The Jackson Hole Airport is but one of many sources of noise that impact the natural soundscapes of Grand Teton National Park. The sounds of motor vehicles are ubiquitous throughout the developed areas of the park, and can also be heard at substantial distance from road corridors. Many other sounds, motor boats, snowmobiles, machinery, power tools, and mechanical equipment can be heard in the park. Under either alternative, the National Park Service will prepare a soundscape management plan for the park to determine how best to protect the natural soundscapes and determine desired future conditions. This may be a desirable prerequisite for any effort to establish goals for the airport and other sources of noise.

3. Expand Noise Monitoring and Measurement Programs. The Jackson Hole Airport currently has an advanced noise monitoring and measurement program. The Board maintains five permanently installed noise monitoring stations (four of them in the park and one in a residential community just south of the airport). This noise monitoring program is specifically designed to measure sounds from airport-related aircraft operations. The monitors are located in areas that have been agreed to by the National Park Service and provide data used in determining the Board's compliance with the noise requirements of the 1983 agreement. In addition, with the installation of the Federal Aviation Administration's Air Traffic Control Beacon Interrogator-6 aircraft tracking system at the airport in 2008, each aircraft noise event can be correlated to individual aircraft. This capability can provide the Board and National Park Service with depictions of the noise exposure that is related to specific aircraft operations. For each aircraft arriving at or departing the airport, data are captured that include the aircraft tail number, type of aircraft, and detailed flight track information such as altitude, speed, and heading. Computer software can be used to display the aircraft's noise "footprint as it moves over the park and surrounding areas.

   In addition to the Board's noise monitoring equipment and capabilities, Grand Teton National Park maintains fixed and portable state-of-the-art sound monitoring equipment as part of its sound monitoring program. These sound monitors are used at numerous locations to collect data to quantify both natural and non-natural sounds. Aircraft sounds are the specific focus at some of these measurement locations, but the program was not designed to target operations related to Jackson Hole Airport. Many other sounds are of interest including the measurement of the non-natural sounds of road vehicles, over-snow vehicles, utilities, motorboats, and high-flying aircraft, and the identity and extent of the park's many and diverse natural sounds.

   Four of the five airport noise monitoring locations are within 4 miles of the airport runway, and the fifth is approximately 6 miles north of the runway. Additional long-term locations tied into the existing airport system might provide data of the airport's operation impacts in areas currently not as well understood. They could also be located in strategic areas to specifically measure the beneficial changes in airport operations resulting from mitigation measures. Another benefit would be that upgraded systems might be used to measure aircraft audibility based on any number of user-defined parameters.

Improved Technology and New Procedures

4. Pursue Implementation of NextGen Approach and Departure. The Next Generation Air Transportation System (NextGen) is the Federal Aviation Administration's plan to modernize the National Airspace System through 2025. This program is intended to address the national growth in air traffic while simultaneously improving safety and reducing environmental impacts. One of the benefits of NextGen is that it will allow precision GPS-based approaches and departures which can be designed to reduce environmental impacts in the areas surrounding airports.

   The advantage of NextGen relative to the Jackson Hole Airport is that it could reduce or perhaps eventually eliminate the need for the existing instrument approach to the airport. This approach extends in a straight line from the southern end of Jackson Lake to the threshold of Runway 19, a distance of about 16 miles. When and if available, GPS-based curved approaches and departures would use much less of the airspace over the park, and could therefore allow aircraft to approach or depart the airport with much less effect on the park. The Board is currently working with the Federal Aviation Administration and NetJets to develop a pilot program to evaluate a precision approach around Blacktail Butte with a short final to Runway 19. A similar approach is commonly used by aircraft under visual flight rules, but NextGen could make it available for IFR approaches. Under either alternative, the Board, in cooperation with the National Park Service, will continue to work with the Federal Aviation Administration to develop and seek early implementation of NextGen approach and departure procedures for the Jackson Hole Airport.

5. Pursue Establishment of New Instrument Approach to Runway 19. About 85% of arrivals to the airport occur on Runway 19, although many of these are visual approaches that overfly only a small area of the park near the airport. Instrument arrivals to Runway 19 typically involve navigating to the DUNOIR (DNW) VOR, which is located on Rosie's Ridge, approximately 8 miles east of Moran Junction. From that point, the approach proceeds west to a point over Jackson Lake near Signal Mountain, at which point the localizer is intercepted. Once on the localizer, the approach proceeds south, directly to the airport for a straight in landing on Runway 19. Aircraft are typically at about 13,000 to 14,000 feet above mean sea level crossing DNW. Once on the localizer, aircraft descend from about 11,000 feet to the airport's elevation of 6,451 feet.

   Under Alternative 2, the Board, in cooperation with the National Park Service, would work with the Federal Aviation Administration to determine whether a new instrument approach could be developed to reduce noise impacts on the park. Moving the VOR and/or moving the localizer intercept point further south could potentially reduce aircraft time aloft over the park. Further study and modeling would be necessary to determine what effects a new approach would have on the park, as well as on surrounding wilderness areas.

6. Pursue Establishment of a Precision Approach to Runway 01. As noted above, the majority of landings at the Jackson Hole Airport utilize Runway 19, landing from north to south. Installation of a precision approach to Runway 01, either GPS-based or guided by an ILS, could potentially reduce the number of aircraft utilizing the ILS approach to Runway 19, thereby reducing noise impacts on the park. Even with a precision approach to Runway 01, use of Runway 19 for landing would continue at times when the prevailing southerly winds, departing traffic, and/or other factors dictated the approach direction.

   A GPS-based approach as discussed above may be possible. Under Alternative 2, the Board, in cooperation with the National Park Service, would further evaluate whether different or emerging technologies could make a precision approach to Runway 01 feasible.

7. Reduced Power Takeoffs and Reduced Use of Reverse Thrust. The use of reduced power on takeoff can be used to lessen wear and tear on aircraft engines, as well as reducing noise. The use of reverse thrust on landing is used to slow the aircraft quickly and reduce wear and tear on brakes. Both high takeoff power settings and use of reverse thrust contribute to higher noise impacts near airports.

   The relatively short length of the airport's runway, as well as its high altitude (which results in higher operating speeds on the runway) currently make either of these noise reduction measures impractical and unsafe for most jet operations at the Jackson Hole Airport. It is unknown whether future improvements in aircraft and navigation technologies could make such measures feasible.

Education, Incentives, and Voluntary Compliance

8. Enhance Educational Efforts with Aircraft Owners, Operators, and Pilots. The Board currently meets with airline chief pilots on at least an annual basis regarding airport operations and noise abatement procedures. It also communicates regularly with control tower personnel, the fixed-base operator, and others who have a role in airport operations. The Board also provides information on airport operations and noise abatement procedures through a wide variety of media that are normally used by pilots in flight planning. Under Alternative 2, the Board and National Park Service would develop further outreach procedures and products to enhance the information provided to pilots, and would also meet with representatives of the Federal Aviation Administration to encourage air traffic control procedures into and out of the airport that would facilitate pilot compliance with noise abatement procedures to the maximum extent consistent with the safety of operations. The National Park Service would actively participate in outreach meetings with airline personnel, aircraft owners and operators, Federal Aviation Administration and control tower personnel, and others to encourage operations that minimize impacts on the park.

9. Develop and Implement a Fly Quiet Program. Fly Quiet programs have been implemented at several airports. These programs seek to influence airlines and other aircraft operators to operate as quietly as possible, and typically use a variety of incentives to reward aircraft operators and airlines for operations that reduce noise. For example, this could include developing fleet quality measures for airlines and fractional/charter aircraft and track improvements over time. Operators could be recognized with environmental awards for improvements in fleet quality. Under Alternative 2, the Board would develop and implement a Fly Quiet program for the Jackson Hole Airport.

10. Increase the Number of Hours Voluntary Curfew is in Effect. In 2004, the Jackson Hole Airport Board adopted a voluntary curfew, with a system of notifying owners of aircraft that violate the curfew by letter and requesting them to refrain from further violations. The curfew applies to general aviation aircraft, and is between the hours of 11:30 p.m. and 6:00 a.m. for landing, and 10:00 p.m. and 6:00 a.m. for takeoff.

    The curfew has been largely successful, with only a few violations per month on average. One reason for the high rate of compliance may be the perceived reasonableness of the restricted hours. Since the measure is voluntary, further restriction may have a limited effect and simply increase the number of violations. However, even assuming a similar level of compliance, the effects of further restricting the hours would apply to only a small number of takeoffs and landings and would have little effect on the overall noise impacts of the airport. Rather than reducing the number of operations, takeoffs and landings would be compressed into the hours that the curfew was not in effect. Under either alternative, the Board, in consultation with the National Park Service, will continue to monitor the effectiveness of the voluntary curfew and determine whether any changes are warranted.

Noise and Access Restrictions

The primary program under which the Federal Aviation Administration supports local airport noise compatibility planning and projects is contained within Title 14 *Code of Federal Regulations* 150 (Part 150). The regulations were promulgated to implement the Aviation Safety and Noise Abatement Act of 1979 (ASNA), and provide criteria for a voluntary program that allows airport operators to prepare noise exposure maps and recommend measures in a noise compatibility program to reduce noise and non-compatible land uses. Airport operators may submit noise compatibility programs for approval to the Federal Aviation Administration, and may be eligible for Airport Improvement Program funding to implement noise abatement projects. Part 150 studies must comply with the criteria established in the regulations. The existing noise abatement plan for the Jackson Hole Airport was developed pursuant to a Part 150 study that was completed in 1985. It has been updated at intervals from 1985 to 2003.

As a result of concerns over a proliferation of uncoordinated and inconsistent noise and access restrictions at airports throughout the United States, Congress enacted the Airport Noise and Capacity Act of 1990 (ANCA). ANCA established a comprehensive national policy for regulating aviation noise, established criteria for noise and access restrictions at U.S. airports, and provided for an orderly phase-out of older and noisier Stage 2 aircraft weighing over 75,000 pounds. Under ANCA, a noise or access restriction on Stage 3 aircraft may become effective only if it is agreed to by all aircraft operators using the airport, or it is submitted to and approved by the Federal Aviation Administration following a detailed study and notice process. The Federal Aviation Administration will approve a restriction only if it meets six statutory conditions specified in ANCA:

- The restriction is reasonable, non-arbitrary, and non-discriminatory;
- The restriction does not create an undue burden on interstate or foreign commerce;
- The restriction is not inconsistent with maintaining the safe and efficient use of the navigable airspace;
- The restriction does not conflict with a law or regulation of the United States;
- An adequate opportunity has been provided for public comment on the restriction; and
- The restriction does not create an undue burden on the national aviation system.

Pursuant to the Airport Noise and Capacity Act, the Federal Aviation Administration developed implementing regulations codified at 14 *Code of Federal Regulations* 161 (Federal Aviation Regulations Part 161). The regulations establish a national program for the review of airport noise and access restrictions, and outline the information that the Federal Aviation Administration considers essential to demonstrate the substantial evidence required to support the six conditions for approval of a restriction. The Part 161 regulations also require that the measurements of noise levels at airports and surrounding areas, and the land uses that are normally compatible or non-compatible with various noise exposure levels be identified in accordance with the procedures established in Part 150.

As an example of the types of information that must be provided to the Federal Aviation Administration, the essential information needed to show that the first condition has been satisfied includes 1) evidence that a current or projected noise or access problem exists, and that the proposed action could relieve the problem; 2) evidence that other available remedies are infeasible or would be less cost effective; and 3) evidence that the noise or access standards are the same for all aviation users classes, or that the differences are justified. Typically, the type and amount of data, the rigor of the analysis, and other information needed for Federal Aviation Administration review require a lengthy, time consuming, and costly Part 161 study process. This process has never before been applied in a national park setting.

In the 20 years since the Airport Noise and Capacity Act was enacted, no airport has been successful in imposing a noise or access restriction on Stage 3 aircraft. The Jackson Hole Airport Board imposed a prohibition on the use of Stage 2 aircraft under 75,000 lbs only after obtaining legislative authority in a rider on the 2003 Federal Aviation Administration reauthorization act.

The National Park Service and Jackson Hole Airport Board recognize that the requirements of the Airport Noise and Capacity Act and Part 161, which were not in effect in 1983, make it significantly more difficult to impose noise and access restrictions than it was when the agreement was first signed. With that in mind, the National Park Service and Board have identified a preliminary list of potential measures for consideration to further reduce the impacts of the airport on the Park. If it is determined that any of the following measures should be pursued, such measures could be implemented only with Federal Aviation Administration approval following the completion of a Federal Aviation Regulations Part 161 process.

11. Establish a Mandatory Curfew. In 2004, the Jackson Hole Airport Board adopted a voluntary curfew, with a system of notifying owners of aircraft that violate the curfew by letter and requesting them to refrain from further violations. The curfew applies to general aviation aircraft, and is between the hours of 11:30 p.m. and 6:00 a.m. for landing, and 10:00 p.m. and 6:00 a.m. for takeoff. The curfew has been largely successful, with only a few violations per month on average. One reason for the high rate of compliance may be the perceived reasonableness of the restricted hours. A mandatory curfew would likely have little effect on aviation noise associated with the airport because very few operations normally occur during voluntary curfew hours.

12. Reduce the Single-Event Noise Limit. The 1983 agreement includes a provision that no aircraft louder than 92 dBA on approach, by reference to Federal Aviation Administration Circular 36-3H, may use the airport. The noise levels for each aircraft in the circular are determined through certification of measurements at a specified distance from the runway threshold. With the advent of the stage classification system for aircraft noise, the measurement procedures are different and take into consideration the size/weight of the aircraft as well. Definitions for each of the stages are found in 14 *Code of Federal Regulations* 36.

13. Impose Limits on the Number of Operations. As recorded by the air traffic control tower, there are approximately 140 operations per day at the Jackson Hole Airport during the peak summer season. One way of reducing noise impacts on the park would be to reduce the number of operations. Any such limit would have to be established and implemented in a manner consistent with applicable laws and regulations. At a minimum, it would have to apply equally to all classes of aviation users utilizing the airport.

14. Establish Noise Reduction Targets. The 1983 agreement includes performance requirements related to noise, using the DNL metric to determine whether the Board is in compliance. Specifically, the Board is required to ensure that the 55 DNL contour does not extend into areas of the park that are defined in the agreement as noise sensitive, and furthermore that the 45 DNL contour does not extend west or north of a specified restriction line. The Board has been, and con-

tinues to be in compliance with these requirements, and has demonstrated its compliance through an annual noise report every year since 1986.

The Federal Aviation Administration employs DNL as the metric to be used in determining noise exposure due to its usefulness in correlating the cumulative exposure of individuals with various levels of annoyance. However, the National Park Service believes that other metrics are more useful in describing the impacts of noise on the natural soundscapes of parks. For example, percent-time audible and various time-above metrics (for example, time above 60 DBA) are useful in describing how the natural soundscapes of a park are affected. One possible way of addressing the impacts of the airport on the park would be to redefine the performance requirements in terms of metrics that are designed to be more appropriate to a national park setting.

15. Designate Restricted Airspace. In a 1983 letter to Transportation Secretary Elizabeth Dole, Secretary of the Interior James Watt requested that the Federal Aviation Administration restrict the use of the airspace over noise sensitive areas of Grand Teton National Park. As an interim measure, Secretary Watt asked for a restriction that would specify a minimum altitude of 3,000 feet above ground level over noise sensitive areas of the park, except for operations into and out of the airport. The purpose of both requests was to reduce noise associated with overflights. In March 1984 response letter, the Federal Aviation Administration declined to impose such an airspace restriction, noting that it did not have any special airspace dedicated to environmental issues, and that the operations at the airport did not warrant restricted airspace. The installation of the air traffic control tower in 2000 has established a Class D restricted airspace within a 5-mile radius of the tower, up to an elevation of 3,000 feet above ground level.

16. Eliminate Victor Airways 520 and 311. These established air routes bisect the park from east to west, with a minimum enroute altitude of 15,000 feet above mean sea level. Neither is used frequently. Secretary Watt also requested in his 1983 letter that the Federal Aviation Administration eliminate V520. The Federal Aviation Administration declined, noting that such an action could have the unintended consequence of reducing the altitudes of enroute aircraft. The route has a minimum enroute altitude of 15,000 feet, but if it were eliminated IFR flights could occur as low as 13,000 feet above mean sea level. The National Park Service will consult with the Federal Aviation Administration regarding whether any revisions to the airways or airspace could result in reducing aircraft noise exposure on the park.

17. Enhance Compliance with Use of Preferential Runway. The 1983 agreement states "to the extent feasible, the Board will limit airport approaches from and departures to the north, and encourage pilots taking off to or approaching from the north to maintain a course east of U.S. Highway 26/89 north of Moose." The Board has made this preference well known to pilots and it is also encouraged by the control tower. Nonetheless, primarily because of the prevailing winds, the vast majority of departures are made to the south. For the same reason, most landings are made from the north onto Runway 19. Although many approaches involve flying the 16-mile ILS from Jackson Lake to the airport, a substantial number fly over only a small part of the park near the airport. For example, under VFR conditions, aircraft arriving from the south or east will often proceed to a point just north and east of Blacktail Butte and then enter a left 180-degree turn to fly a short final from approximately Moose to the airport.

    Mandatory use of Runway 01 for landings and Runway 19 for takeoffs would have serious implications for safety due to the direction of the prevailing winds. The length of the runway and its high elevation necessitate that operations occur into the wind in most circumstances. In addition, contra-flow operations would pose safety concerns because of potential conflicts between departing and arriving aircraft. Furthermore, when the ILS approach is required, the only ILS is for Runway 19. A mandatory restriction to enforce use of the preferential runway would require Federal Aviation Administration approval and would likely be denied for safety reasons.

The Board and National Park Service will continue to monitor runway utilization and consistency with the preferential use provisions of the agreement. In addition, the Board and National Park Service will review data on wind speed and direction and other factors influencing runway utilization, and will work with the Federal Aviation Administration and the air traffic control tower to determine how to improve preferential runway use.

18. Restrict or Limit the Amount of the Airport Available to Support General Aviation. The existing aircraft ramp is divided into a general aviation ramp and a more secure air carrier ramp. Approximately 65% of the ramp is for general aviation, and the remaining 35% is for air carrier. As air carrier needs have expanded over the years, the portion available to general aviation has been reduced. During most times of the year, the general aviation ramp is adequate to accommodate general aviation demand. However, during peak times the ramp is not adequate and excess general aviation aircraft must either divert to another airport, or in the case of corporate jet aircraft, it is more likely to result in passengers being dropped off and picked up later, with the aircraft being flown to another airport during the intervening time.

    If less of the ramp were available to support general aviation, it is possible that the number of general aviation operations would be reduced. However, with respect to larger (and noisier) corporate jet aircraft, the number of operations could potentially increase. When there is no room for larger general aviation aircraft to remain at the airport, they usually drop off passengers and go to another airport and return. A reduction in ramp capacity therefore could potentially increase the number of operations and the resulting aircraft noise.

    The Board is required by federal law to make the airport available "to all types, kinds and classes of aeronautical activity on fair and reasonable terms." If limiting the space available for general aviation purposes occurs in conjunction with an expansion of use by the Board for other aviation-related purposes, such as commercial aviation, then this is generally permissible. However, any restriction on general aviation which is not connected with another aviation use (such as a stand-alone restriction as a noise mitigation measure) would be contrary to federal law.

19. Use Incentives to Reduce Impacts of General Aviation. The voluntary curfew on landings and takeoffs that is currently in effect has been successful in reducing late night operations at the airport, although several violations typically occur each month. Currently, the airport's fixed-base operator (FBO) charges a higher rate for its services after curfew hours due to the additional expense of keeping employees on late, or recalling them after hours. Although the higher charges are intended to address legitimate business operations and costs, an incidental effect may be to encourage compliance with the voluntary curfew.

    Similar market-based incentives could potentially be used to encourage charter and general aviation aircraft operators modify behaviors in a manner that would reduce impacts on the park. However, if intended primarily to address noise, and/or serve as a restriction on use, such measures would be subject to the Federal Aviation Regulations Part 161 approval process.

Other Mitigation and Environmental Protection Measures

20. Construct Glycol Recovery System. Propylene glycol is used for deicing aircraft. Prior to 2008, glycol that did not remain on the aircraft was allowed to simply evaporate from the ramp or be

handled with storm water runoff. In 2008, the Board obtained a vacuum truck to remove glycol from the ramp and began trucking it to a Salt Lake City area recycle facility. The Board currently has a project in the airport's capital improvement plan to design and construct a deicing pad that would collect and recover glycol in a designated tank. When completed, such a system will significantly reduce glycol runoff into the storm water system. In addition, glycol use could be reduced by using forced air to blow accumulated snow from an aircraft, rather than using glycol to melt it.

21. Further Reduce the Effects of Fugitive Light Emissions. Sources of light emissions from the airport include airfield lighting, such as runway, taxiway, approach, and other lighting systems designed to guide aircraft operations; parking lot lights, external building lights in and around pedestrian or vehicle movement areas. Light emissions have been reduced by a variety of measures. Pilot-activated runway lights remain off unless activated by a pilot prior to landing or takeoff. Certain portions of the parking lot are left unlighted after the last scheduled arrival at night. Lights on the ramp are shielded, and parking lot lights are of low intensity. Additional measures to curb light emissions could include the use of LED lights where applicable/feasible, further reduce the time pilot-activated runway lights remain on (currently 15 minutes), and installation of motion-activated lighting systems.

    Under Alternative 2, the Board, in consultation with the National Park Service, would periodically review airport light emissions and the effects on night skies to determine any additional measures and new technology that may be used to reduce the effects of airport lighting.

22. Reduce Energy Consumption. The Board has recently issued a request for proposals to begin the process of pursuing ISO 14001 certification. There are numerous actions that could be taken to reduce energy consumption, including limit idle time for vehicles and equipment (applicable to the airport, tenant, and contractors), use of LED lighting, replace gasoline-powered fleet vehicles with electric, LNG, or hybrid vehicles, and provide incentives for rental car companies to include hybrid or high mileage vehicles in their fleets. Motion-activated lighting or reductions in the duration of pilot-activated lighting could also reduce energy consumption, as could use of alternative energy sources to power some lighting systems, such as parking lot lights. The use of mobile ground power units for aircraft could be reduced or eliminated by providing 440V 200 amp power connections.

23. Conversion of Boilers, Generators, and Other Ground Equipment to Clean Energy Sources. In addition to the energy saving measures described above, under Alternative 2 the Board would pursue conversion of its boilers and stand-by electrical generators from fuel oil or diesel to clean energy sources such as propane or natural gas.

24. Visual Quality and Vegetation/Habitat. The Board has planted trees and other vegetation at many locations on and around the airport perimeter, masking its presence from various locations. Under Alternative 2, this practice would be continued to further screen the airport, such as by planting trees along the access road and in other areas. Grasses could be planted in the unpaved but disturbed areas beyond the runway, and in other areas, to reduce the heat plume.

25. Wildlife. Under either alternative, the Board and National Park Service will collaborate to develop procedures, methods, and strategies regarding techniques to minimize conflicts between sage grouse and aircraft. The lek at the north end of the runway has been present for decades, despite the presence of aircraft. In cooperation with the National Park Service, the Board will develop procedures, methods, and strategies to minimize conflicts between sage-grouse and aircraft operations. In addition, the National Park Service and Board will collaborate on funding

research studies that could help determine whether the airport is affecting other wildlife, such as gleaning bats and insects that may be sensitive to noise and light emissions.

COSTS OF THE ALTERNATIVES

DIRECT CAPITAL AND IMPLEMENTATION COSTS FOR ALTERNATIVES

Both alternatives are administrative actions. Neither would involve any capital improvements. Therefore, at least until 2033, there would not be any direct capital costs associated with either alternative for either the National Park Service or the Jackson Hole Airport Board.

Some changes in operational costs would be associated with the alternatives. For example, for either alternative, the National Park Service and Jackson Hole Airport Board would continue to incur costs associated with the evolving management of the airport. However, the costs of these changes would be negligible to both organizations compared to their current operating costs and could be accommodated with existing staffing resources.

Indirectly, the alternatives would have costs to operate and maintain the airport, at least through the year 2033. These costs would be higher for Alternative 2 because the airport would be maintained to meet Federal Aviation Administration Part 139 certification standards for scheduled passenger service.

INDIRECT CAPITAL COSTS ASSOCIATED WITH ALTERNATIVE 1

All of the values presented here are in 2008 dollars and are rough estimates. They do not consider feasibility or other factors that could significantly affect cost. Therefore, these estimates should not be used for budgetary purposes; rather, they are presented for comparison between the alternatives.

Airport Removal and Site Restoration

In Alternative 1, the airport would close on April 27, 2033. In accordance with section 7(d) of the 1983 agreement, Jackson Hole Airport Board must remove the terminal building and restore its site within six months. The National Park Service would then remove all remaining buildings, fencing, and pavement, and restore the site to a near-natural condition.

Costs for removing features from the Jackson Hole Airport and restoring the site were estimated based in part on the actual costs incurred by the City and County of Denver when it closed and restored the site of the former Stapleton International Airport. However, costs were adjusted based on the recognition that there is a limited market for recycled materials in western Wyoming and eastern Idaho and that transport costs may largely offset salvage value (Danczyk, 2008). Costs at the Stapleton International Airport site provided by Wood (2006), and how they were applied to develop this cost estimate for the Jackson Hole Airport, are described below. All costs would need to be adjusted in 2033 to account for inflation and changes in the prices of commodities.

- The Stapleton International Airport runways, taxiways, fences, and roads were all removed at no cost by a recycling company. This firm then made a profit by selling the resulting aggregate, steel rebar, pipes, tanks, and other recovered materials. Although similar materials removed from the

Jackson Hole Airport would have some salvage value, it could be minimal because of transportation costs to move the materials to other markets. Calculations prepared using construction data from RSMeans® indicate a removal cost of about $3 million (Danczyk, 2008).

- The cost to Denver for removing structures from the 4,500-acre Stapleton site was $10 million. The Jackson Hole Airport, at 533 acres, is 12% of this size. Using this ratio, the cost to remove structures at the Jackson Hole Airport would be about $1.2 million.
- The Stapleton site had extensive areas that were contaminated with spilled or leaked fuels and solvents, and asbestos-lined pipe had been used on the site. Because Stapleton was scheduled for rapid redevelopment for residential use, large volumes of contaminated soil were excavated and hauled away for offsite disposal. These conditions resulted in a site-wide remediation cost of $50 million. In contrast, the Jackson Hole Airport site is thought to be free from soil contamination (see "Water Quality and Hydrology" in Chapter 3), and any contamination that was discovered could be remediated using more time consuming but much less costly, in-place methods. Therefore, the estimated cleanup cost for the Jackson Hole Airport would be about $1 million.

The Jackson Hole Airport was constructed on a flat plain of outwash material deposited by the flow from melting glaciers. Therefore, there would not be any need to recontour the Jackson Hole Airport site to match the surrounding terrain. The site could be allowed to revegetate naturally, or the disturbed areas (about 20% of the land within the airport boundary) could be reseeded with a mixture of native plants at a cost of about $100 per acre. With either approach, the cost for revegetation would be minimal.

Based on these values plus 20% contingencies, the cost for airport removal and site restoration that would be associated with Alternative 1 would be about $6 million.

Alternate Airport

Many of the passengers who annually enplane at the Jackson Hole Airport may continue to access the region by air. As discussed in Chapter 4 regarding impacts of Alternative 1, that demand could potentially be met by expanding the Idaho Falls Regional Airport, which is the nearest airport that already offers scheduled passenger service. In the three-year period 2006-2008, this airport recorded about 150,000 enplanements annually, compared to an average of about 300,000 annual enplanements at the Jackson Hole Airport (Federal Aviation Administration 2006f, 2009).

This approach would require substantial grant funding from the Federal Aviation Administration for capital improvements. Based on information provided by the Federal Aviation Administration, the approximate costs for expanding the Idaho Falls Regional Airport to handle its current passenger traffic plus the passenger traffic that currently uses the Jackson Hole Airport, and the anticipated future growth for both facilities would be about $50 million (Bishop 2007b).

Highway Upgrades to an Alternate Airport

As described in the "Surface and Air Transportation" section in Chapter 3, many of the highways between Jackson and the Idaho Falls Regional Airport operate year-round near their design capacities and exceed their capacities throughout the summer. Alternative 1 would increase the traffic loads on these highways by about 20%. Highway upgrades would be necessary to handle airport-related traffic and would represent indirect capital costs associated only with Alternative 1.

The Alternative 1 analysis in the "Surface and Air Transportation" section includes an estimate of the costs of upgrading the state highways between Jackson and Idaho Falls over Teton Pass to a four-lane road. Estimates were based on information provided by the District 3 traffic engineer for the Wyoming Department of Transportation (Thomas 2006) and the District 6 engineer for the Idaho Transportation Department (Cole 2006). Calculations showed that the current cost for upgrading the existing, two-lane state highways to four-lane configurations along the Teton Pass route from Jackson to Swan Valley, Idaho, which is east of Idaho Falls, would be about $280 million. These costs do not include any highway improvements on U.S. Highway 26 between Jackson and Idaho Falls (see Figure 1), because this road has adequate capacity to handle anticipated traffic changes.

Total Indirect Capital Costs Associated with Alternative 1

The indirect costs that would be required to maintain air service in the region if Alternative 1 were implemented would include the following:

- Airport removal and site restoration — $6 million
- Idaho Falls Regional Airport capital improvement costs — $50 million
- Highway upgrades over Teton Pass — $280 million

The total, indirect capital costs for implementing Alternative 1 would be about $336 million. These costs would not occur with the implementation of Alternative 2.

INDIRECT CAPITAL COSTS ASSOCIATED WITH FEDERAL AVIATION ADMINISTRATION GRANT FUNDS

Alternative 2 would allow the Jackson Hole Airport to maintain eligibility for Federal Aviation Administration grant funding under the Airport Improvement Program and passenger facility charges. As described in the "Socioeconomics" section in Chapter 3, the value of this grant funding to the airport fluctuates from year to year, but has averaged about $3 million annually over the past decade. Based on this value, a loss of federal funding during the 20 years of the agreement term from 2013 to 2033 would result in the loss of $60 million to the Jackson Hole Airport Board and regional economy in federal grant funding.

THE PREFERRED ALTERNATIVE AND ENVIRONMENTALLY PREFERRED ALTERNATIVE

The preferred alternative for extending the airport agreement is Alternative 2.

The environmentally preferred alternative is defined as "the alternative that will best promote the national environmental policy expressed in the National Environmental Policy Act's section 101." This generally is interpreted to mean the alternative that causes the least adverse effect on physical, biological, and cultural resources. However, the policy also considers beneficial use of the nation's resources and providing a high standard of living.

Section 101(b) of the National Environmental Policy Act identifies six criteria to help determine the environmentally preferred alternative. The act directs that federal actions should:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
2. Assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.
3. Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences.
4. Preserve important historical, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice.
5. Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities.
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The alternatives for the Jackson Hole Airport agreement extension differ in their abilities to fulfill these criteria. Effects of the alternatives relative to these criteria are described below. A more detailed evaluation of effects is provided in "Chapter 4, Environmental Consequences."

1. Fulfill the Responsibilities of Each Generation as Trustee of the Environment for Succeeding Generations

Alternative 1, the no action alternative, would remove the Jackson Hole Airport from within Grand Teton National Park after the existing agreement expired in the year 2033. As a result, it would be most effective in allowing the National Park Service to meet its obligation to future generations as trustee of the environment of Grand Teton National Park.

On a larger scale, a reasonably foreseeable cumulative action that would result from Alternative 1 would be the expansion of an alternate airport elsewhere in the region. Associated with that action would be the major upgrade of the roads leading from the alternate airport to the national parks, national forests, and ski resorts north of Jackson that currently are accessed through the Jackson Hole Airport. Adverse effects may occur at the alternate airport site and, particularly, along the highways from the alternate airport to the Jackson area, which may go over the environmentally sensitive Teton Pass. By maintaining the existing airport, Alternative 2 would enable this generation to be a better trustee of the environment along approximately 50 miles of mountain roads, with associated wetlands, soils, geologic resources, cultural features, and scenic views, for succeeding generations.

2. Assure for All Americans Safe, Healthful, Productive, and Esthetically and Culturally Pleasing Surroundings

With regard to aviation at Jackson Hole Airport, there would be little difference between the alternatives regarding this criterion's goal of safe and healthful surroundings, although they would meet the goal using different approaches. Alternative 2 would promote safety and health for aircraft pilots and passengers by providing facilities and equipment that meet Federal Aviation Administration standards for scheduled passenger service. Alternative 1 would ensure safety by changing Jackson Hole airport operations to allow only general aviation at a level that was considered safe by pilots.

Alternative 2 would continue the benefits of productive surroundings that the Jackson Hole Airport currently provides to the northwest Wyoming region. Alternative 1 would transfer many of those benefits to the community where the alternate airport was located, or to other communities throughout the western United States where potential visitors decided to take vacations because of easier access.

Removing the airport after 2033 under Alternative 1 would best meet the second criterion's goal of providing aesthetically and culturally pleasing surroundings within Grand Teton National Park. However, as described above, a reasonably foreseeable connected action would be the reconstruction and widening of parts of the mountain highways between Jackson and an alternate airport. Major road reconstruction would produce large land disturbances associated with cuts and fills, including disturbances of the extensive wetlands along the highway routes, and would substantially increase the visibility of the road corridors on the landscape. It also would alter the historic alignments of these roads, remove the historic roadbeds that still are in use in many areas, and result in the removal of any prehistoric or historic cultural resources in the new, enlarged rights-of-way.

3. *Attain the Widest Range of Beneficial Uses of the Environment without Degradation, Risk to Health or Safety, or Other Undesirable and Unintended Consequences*

Alternative 2 would be more effective than Alternative 1 in meeting this criterion's goals. Under this alternative, the airport would continue to function as a key component of the economy of Teton County, northwest Wyoming, and eastern Idaho without any additional degradation of Grand Teton National Park. In contrast, Alternative 1 would have serious undesirable and unintended consequences, described for the previous two criteria, relating to the expansion of another airport to serve the region, widening of environmentally sensitive road corridors, and displacement of economic productivity.

4. *Preserve Important Historical, Cultural, and Natural Aspects of Our National Heritage, and Maintain, wherever Possible, an Environment which Supports Diversity and Variety of Individual Choice*

Within Grand Teton National Park, Alternative 1 would best meet this criterion's goal of preserving important historical, cultural, and natural aspects of our national heritage by, after 2033, restoring the airport site to a natural condition and eliminating airport-related sound. In addition, this alternative could contribute indirectly to the preservation of historical, cultural, and natural resources outside the park by potentially reducing economic incentives to convert private lands that have been used primarily for agriculture into residential or commercial developments.

Regionally, the goal to preserve important historical, cultural, and natural aspects of our national heritage would be better met by Alternative 2. As described previously, Alternative 1 likely would result in construction to expand an alternate airport and the widening or upgrade of mountain highways, including the environmentally sensitive and historic Teton Pass road. These actions would have substantial adverse effects on the surrounding historical, cultural, and natural resources that would not occur with Alternative 2. Pressures to convert private agricultural lands into residential or commercial developments would continue regionally, but would be relocated more to the vicinity of the alternate airport or along the improved road corridors.

With regard to supporting diversity and variety of individual choice, Alternative 2 would promote economic diversity and provide additional choice in modes of transportation to access the region. However, it would limit the ability of individuals to choose to enjoy a natural soundscape within Grand Teton National Park without being affected by airport-related sound.

5. *Achieve a Balance between Population and Resource Use which Will Permit High Standards of Living and a Wide Sharing of Life's Amenities*

Within Teton County and the northwest Wyoming region, Alternative 2 would best meet this criterion's goal of achieving a balance between population and resource use. Without the need for any new construction, the Jackson Hole Airport would remain a key component of the economy and would continue to provide easy access to this otherwise geographically remote area's amenities.

6. *Enhance the Quality of Renewable Resources and Approach the Maximum Attainable Recycling of Depletable Resources*

Alternative 1's reasonably foreseeable outcome of the expansion of an airport elsewhere in the region and the upgrading and widening of roads from that airport to the Jackson area would result in the use of large quantities of depletable resources. As a result, Alternative 2 would be more effective in fulfilling this criterion.

Summary of Ability to Fulfill Criteria

Alternative 1 would best promote the natural and cultural components of the environment within Grand Teton National Park by restoring the 533-acre airport setting to a natural condition and eliminating airport-related sound in the park. On a regional scale, Alternative 2 would better protect the nation's natural and cultural resources by continuing the use of an existing facility rather than indirectly causing extensive new construction in environmentally and historically sensitive settings outside the park. Alternative 2 would be more effective than Alternative 1 in balancing resource use with the environment. The social and economic benefits provided by Jackson Hole Airport would continue without any additional degradation of the natural and cultural resources in the park or the region.

When these factors are weighed with regard to, as stated in the fifth criterion, the ability to "Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities," Alternative 2 is environmentally preferred because it would be most effective in promoting the values expressed in the National Environmental Policy Act.

SUMMARIES

NPS guidance in *Director's Order #12 and Handbook: Conservation Planning, Environmental Impact Analysis, and Decision Making* (NPS 2001a) requires that environmental impact statements include several summaries to facilitate reader understanding. These include summaries on the important features of the alternatives and the impacts of each alternative.

As described in the "Purpose and Need" section in Chapter 1, the Jackson Hole Airport Board has requested two additional 10-year extensions to the existing airport agreement. The current term of the agreement is for a total of 50 years. The existing agreement was signed on April 27, 1983 and authorizes operation of the airport until April 27, 2033.

Alternative 1 would not grant the two 10-year extensions to the existing agreement. Because the Federal Aviation Administration requires the Jackson Hole Airport Board to demonstrate "satisfactory property interests" of more than 20 years on the airport land, this alternative would end the Board's eligibility for Federal Aviation Administration funding in 2013.

Alternative 2 would allow the airport to maintain eligibility for federal funding by 20 years beyond 2013 by granting the two 10-year extensions and changing the total term of the agreement to 70 years. This action would enable the Jackson Hole Airport to continue to provide scheduled passenger services until 2033. Alternative 2 also would contain provisions to further reduce and mitigate the impacts of the airport on the park

The important features of each alternative are summarized in Table 4. Detailed descriptions of the features of each alternative were provided earlier in this chapter. Table 5 provides a brief summary of the effects of each alternative on the impact topics retained for analysis (see Table 3).

- The table includes both adverse and beneficial effects of the alternatives and identifies their intensity (negligible, minor, moderate, or major), duration (short-term or long-term), geographic area of effect, and whether they would be direct or indirect.
- The table also includes a summary of whether impairment would occur to the park's scenery, natural and historic objects, or wildlife such that they could not be enjoyed by future generations, and whether unacceptable impacts on park resources would occur.

The detailed information supporting Table 5 on the effects of the alternatives is provided in "Chapter 4, Environmental Consequences."

A summary of how each alternative would achieve the requirements of sections 101 and 102(1) of the National Environmental Policy Act was included above under the heading "The Preferred Alternative and Environmentally Preferred Alternative." There would not be any conflicts between any of the alternatives and any environmental laws.

TABLE 4: KEY FEATURES OF THE ALTERNATIVES FOR EXTENDING THE 1983 AGREEMENT FOR JACKSON HOLE AIRPORT IN GRAND TETON NATIONAL PARK

Key Element	Alternative 1: No Action / Continue Current Agreement	Alternative 2: Preferred Alternative
Use agreement term	Would maintain the existing agreement term at a total of 50 years.	Would amend the existing agreement to provide two additional 10-year options beyond the current expiration date of April 27, 2033 to a total of 70 years.
Airport closure	Airport would close on April 27, 2033.	Airport would close on April 27, 2053.
Grant funding eligibility	Airport would become ineligible for Federal Aviation Administration grant funding on April 27, 2013.	Airport could maintain eligibility for Federal Aviation Administration grant funding until April 27, 2033.
Scheduled passenger service	Would end when the inability to maintain the airport, caused by the lack of federal funding eligibility, resulted in the airport losing its Part 139 certification. This analysis assumed that loss of certification would occur in 2015.	Would continue at least through April 27, 2033.
General aviation	Could continue until 2033. Would end with the closure of the airport.	Could continue until 2053.

TABLE 4: KEY FEATURES OF THE ALTERNATIVES FOR EXTENDING THE 1983 AGREEMENT FOR JACKSON HOLE AIRPORT IN GRAND TETON NATIONAL PARK (CONTINUED)

Key Element	Alternative 1: No Action / Continue Current Agreement	Alternative 2: Preferred Alternative
Mitigation	Existing mitigation would continue, with continuous review to incorporate new prudent and feasible technological advances to further reduce noise impacts on the park.	In addition to mitigation commitments of Alternative A, the Jackson Hole Airport Board would develop and implement reasonable and cost-effective mitigation measures to reduce environmental impacts on the park to the lowest practicable levels consistent with the safe and efficient operations of the airport, and with applicable law and existing contractual obligations.
Review of agreement terms	The Jackson Hole Airport Board and National Park Service would confer on a continuing basis regarding changed circumstances, including technological advances. These two parties would negotiate in good faith to adopt reasonable amendments to the agreement relative to any changed circumstances. Reporting would include an annual financial report.	The timeframe for conferring would be "from time to time" rather than on a continuing basis. No less often than every five years, the terms and conditions of the agreement would be comprehensively reviewed to discuss whether any amendments would result in better ensuring that the airport remained compatible with the purposes and values of the park, improve the safety and efficiency of park and/or airport operations, or otherwise be appropriate. Reporting would be expanded to include a biennial report to the park superintendent describing activities and operations for the previous two calendar years, efforts at reducing negative environmental impacts, and efforts to reduce noise impacts on the park.
Direct costs	Would result in negligible increases in administrative costs associated with the evolving management of the airport.	Same as Alternative 1.
Indirect capital costs	Would require about $6 million for airport removal and site restoration, $50 million for upgrades for the Idaho Falls Regional Airport, and $280 million for highway upgrades to the alternate airport. Loss of federal funding during the last 20 years of the agreement term would result in the loss of $60 million to the Jackson Hole Airport Board and regional economy in federal grant funding.	No indirect capital costs would occur because existing features, with ongoing maintenance, would continue to be used.

TABLE 5: IMPACTS OF THE ALTERNATIVES

Impact Topic	Alternative 1: No Action / Continue Current Agreement	Alternative 2: Preferred Alternative
Natural soundscape	Alternative 1 would make the park quieter by decreasing the percent of the park in which sound from airport-related aircraft would be audible more than 10% of the time, from 24% of the park in 2005 to 20% of the park in both 2015 and 2025. However, because the thresholds involve comparisons to the natural soundscape, the airport would continue to have a major, direct, long-term, adverse impact. The southern part of the park, particularly areas within a few miles of the airport, would be most affected. With increasing distance from the airport and flight paths, aircraft sounds would diminish to the point of being a negligible impact. Maximum sound levels at most points in the park would be similar to those occurring in 2005. However, in 2015 and 2025, an additional 7% of the modeled points in the park would experience maximum sound levels greater than 60 dBA, compared to the baseline. The 15-hour energy-average sound level (Leq) which, because of the curfew, effectively represents the day-night average sound level (DNL), would be little changed compared to the baseline. The DNL would remain within the requirements stipulated in the 1983 agreement. Compared to the 2005 baseline, there would be little change in 2015 or 2025 regarding the percent of the time above 60 dBA at locations in the park, effects on the natural soundscape in the park's recommended wilderness, or sound impacts outside the park. When the airport closed in 2033, its effects on the natural soundscape of the park would cease. Sound levels outside the park north of Jackson would decrease. Areas around the airports that received increased use because of the air traffic that was displaced from the Jackson Hole Airport would experience increased noise impacts. No impairment would occur to the park's natural soundscape.	In both 2015 and 2025, aircraft using the Jackson Hole Airport would be audible more than 10% of the time in about 27% of the park. The effects on the natural soundscapes of Grand Teton National Park would be major, direct, long-term, and adverse. As with Alternative 1, effects would be most evident within a few miles of the airport, and would diminish with distance to the point of being negligible impacts. More points in the park would experience maximum sound levels in the range of 50 dBA to 70 dBA than under Alternative 1. The number of points exposed to maximum sound levels above 70 would not change. The 15-hour energy-average sound level (Leq) would extend slightly beyond the Alternative 1 contours, but the DNL would remain within the requirements stipulated in the 1983 agreement. Compared to Alternative 1, there would be little change in 2015 or 2025 regarding the percent of the time above 60 dBA at locations in the park. At points in the recommended wilderness boundary, impacts of Alternative 2 would be slightly higher. Outside the park, the Federal Aviation Administration's criterion for significance potentially could be met in an area immediately south of the airport boundary by 2025. Other areas under the flight path south of the airport might meet the marginal effects criteria. No impairment would occur to the park's natural soundscape.
Visitor use and experience	During the general aviation period from 2015 to 2033, non-natural sounds from scheduled passenger aircraft would be absent, resulting in direct, negligible to moderate, long-term, beneficial impacts. After the airport closed in 2033, all sounds associated with the Jackson Hole Airport would cease, resulting in direct, negligible to moderate, long-term, beneficial impacts on the experience of park visitors. The degree of impact would depend on individual visitor expectations as well as their location in the park relative to the airport.	Impacts would be long-term, direct, and adverse, and would range in intensity from negligible to moderate. The degree of impact would depend on individual visitor expectations as well as their location in the park relative to the airport.

TABLE 5: IMPACTS OF THE ALTERNATIVES (CONTINUED)

Impact Topic	Alternative 1: No Action / Continue Current Agreement	Alternative 2: Preferred Alternative
Air quality	In 2015 and 2025, emissions of air pollutants from the Jackson Hole Airport would be reduced relative to emissions in the modeled existing conditions baseline, which would have a long-term, direct, beneficial, impact on air quality. After 2033, closure of the airport would eliminate airport-related emissions and, thus, reduce the emissions profile of the park. This would have a direct, long-term, beneficial impact on air quality in Grand Teton National Park. Prior to 2033, cumulative impacts would be adverse and long-term for all modeled parameters because of the continued contribution of airport emissions. After 2033, impacts would change to negligible or beneficial.	Emissions would be greater, but for most parameters, the differences would be too small to measure in modeling, or to discern from the year-to-year meteorological variation. The intensity of impacts for these parameters would be negligible. Intensities that were greater than negligible were for tons-per-year emissions of the criteria pollutant carbon monoxide (adverse, direct, long-term, and minor) and deposition rates for nitrogen and sulfur (adverse, direct, long-term, and moderate). Emissions from implementing this alternative would be lower in both 2015 and 2025 than emissions currently occurring under the modeled existing conditions baseline. Therefore, on a relative basis, impacts from Alternative 2 would be greater than those that would occur with Alternative 1, and less than those associated with the current condition. Cumulatively, Alternative 2 would have adverse, long-term impacts because airport emissions would continue to contribute to the total emissions profile for the park.
Visual quality and dark skies	Until 2033, negligible effects would occur on the visibility of airport facilities and scenic integrity levels. Following airport closure, there would be long-term, beneficial, direct effects of minor or moderate intensity in foreground views from within the former development subzone and minor intensity in midground views looking west from observation points along U.S. Highway 26/89/191. Effects on scenic integrity levels of other views, including background views of the Teton Range, would be negligible. The direct, long-term, beneficial effect on the scenery and visibility of vistas from observation points along the highway because of aircraft in flight would be negligible after 2015, and minor after the airport was closed. Until 2033, effects on the visibility of dark skies would be negligible. Long-term, direct, beneficial effects would occur after the airport closed. The intensity of the change would be negligible to minor in the south part of the airport, minor to moderate in the north part of the airport, and moderate in the former development subzone area. Changes in the visibility of dark skies in the remainder of the park would be negligible. Negligible effects would occur on the cumulative changes in visual quality and the visibility of dark skies outside the park. No impairment would occur to the park's visual quality or dark skies.	A negligible effect on the visibility of airport facilities would occur. Increased air traffic would cause direct, adverse effects of minor intensity for some viewers at observation points along U.S. Highway 26/89/191 between the Teton Point Turnout and airport road intersection. Within the airport boundary, there would be negligible effects on the visibility of dark skies. Along the airport road and U.S. Highway 26/89/191 between the airport and Jackson, increased light emissions from headlights associated with increased airport-related traffic would have a direct, long-term, adverse effect of minor intensity during moonless, cloudless evenings, nights, and early mornings. At other times, impacts would be negligible. There would be negligible cumulative effects on the visibility of dark skies in Jackson or areas of Teton County outside the immediate vicinity of the airport. No impairment would occur to the park's visual quality or dark skies.

TABLE 5: IMPACTS OF THE ALTERNATIVES (CONTINUED)

Impact Topic	Alternative 1: No Action / Continue Current Agreement	Alternative 2: Preferred Alternative
Water quality and hydrology	There would be negligible effects on hydrology during the general aviation period and after airport closure. Negligible water quality impacts would occur with regard to National Pollutant Discharge Elimination System-permitted outfalls for storm water and septic tanks; fuel spills and/or leaks; glycol deicer use and disposal; aircraft and rental car maintenance operations; and discharges to the Enterprise Canal. No impairment would occur to the park's water quality or hydrology.	Impacts would be the same as those described for Alternative 1.
Wildlife and their habitats, including special concern, threatened, and endangered species	Until 2033, impacts would be negligible on general wildlife habitat availability and on habitat of migratory birds and species of concern. After 2033, when the airport perimeter fence was removed and developed areas were restored to native vegetation, there would be a negligible to minor, long-term, direct, beneficial impact on these wildlife habitats. Impacts on habitat of endangered or threatened species would be negligible, which equates to a "no effect" determination under section 7 of the Endangered Species Act. Prior to 2033, the adverse effects on greater sage-grouse that are associated with airport operations would continue, resulting in a negligible impact. After 2033, the end of airport-related disturbances and mortality, and the restoration of 128 acres of sagebrush habitat, would have a minor, long-term, direct, beneficial impact. Aircraft sound effects on wildlife would continue until 2033, which would be a negligible impact. Reduced sound exposure that would result from closure would have a minor, long-term, direct, beneficial effect on wildlife, with little consequence at the population level. Locally, wildlife mortality because of collisions with aircraft or vehicles on roads would decrease. However, a cumulative effect would be an increase in these types of incidents at other locations that had increased air and highway traffic because of flights that had been displaced from Jackson. The net effect on wildlife would be negligible. Implementation of Alternative 1 would have a negligible contribution to ongoing trends of wildlife habitat loss that are occurring because of development throughout the region. No impairment would occur to the park's wildlife; threatened, endangered, or special concern species, or their supporting habitats.	Until 2033, impacts would be negligible on general wildlife habitat availability and on habitat of migratory birds and species of concern. After 2033, impacts would be minor, long-term, direct, and adverse compared to Alternative 1 but negligible compared to current conditions. Impacts on habitat of endangered or threatened species would be negligible before and after 2033. This finding equates to an Endangered Species Act "no effect" determination. Habitat effects on greater sage-grouse would be minor, long-term, direct, and adverse both before and after 2033. Until 2033, aircraft sound effects would negligible. After that year, sound would have a minor, long-term, direct, adverse effect on wildlife, with little consequence at the population level. Effects of collisions between birds and aircraft would be negligible, except for sage-grouse. Impacts on this species would be long-term, direct, adverse, and of minor intensity Alternative 2 would result in higher mortality of wildlife on area highways, but cumulatively, the net effect would be negligible. Alternative 2 would have a negligible contribution to ongoing trends of region-wide wildlife habitat loss. No impairment would occur to the park's wildlife; threatened, endangered, or special concern species, or their supporting habitats.

TABLE 5: IMPACTS OF THE ALTERNATIVES (CONTINUED)

Impact Topic	Alternative 1: No Action / Continue Current Agreement	Alternative 2: Preferred Alternative
Park and airport operations	For the National Park Service, effects would be negligible on the operation of the park, planning for transit, ensuring cooperation with the Jackson Hole Airport Board, and the amount of payments to the U.S. Department of the Interior. Negligible to minor, adverse, short-term effects would result to interagency helibase operations. For the airport during the transition and general aviation periods, impacts on facilities in the development subzone would be long-term, direct, adverse, and of moderate intensity. Negligible impacts would occur on development of facilities outside the development subzone. Beginning in 2015, major, long-term, direct, adverse impacts on use and operations patterns would result from the loss of about 25% of the current air traffic levels, all scheduled passenger service, and ground services other than those supporting general aviation. Following airport closure, the impacts on airport facilities, use and operations patterns, and capacity would be direct, long-term, adverse, and of major intensity.	For the National Park Service, the effects of Alternative 2 on the operation of Grand Teton National Park would be long-term, minor, and adverse as a result of the ongoing need to commit park resources to address operation of the airport. Impacts on interagency helibase operations would be negligible to minor. Effects regarding airport facilities and infrastructure would be long-term, direct, moderate, and beneficial. This alternative would continue the airport's eligibility for Federal Aviation Administration grants, which would enable the Jackson Hole Airport Board to continue to operate, maintain, and upgrade the runway, taxiway, passenger terminal, safety equipment, roads and parking, and all other facilities that enable the airport to support scheduled passenger and general aviation. The effects of Alternative 2 on airport operations and use patterns would be long-term, direct, beneficial, and negligible to minor. This includes impacts to numbers of operations and passenger enplanements, operational profile with regarding the mix of scheduled passenger and general aviation operations, and aircraft sizes in the fleet mix that uses the airport.
Public health and safety	During the general aviation period, long-term, direct, adverse effects on safety of moderate intensity would result from the inability of the airport to install upgraded navigational aids; purchase snowplows, fire trucks, and other major pieces of safety equipment; and maintain rescue training at current levels. Minor, long-term, direct, adverse effects would result from reduced maintenance of the runway and taxiway and reduced availability of medical evacuations for non-critical conditions. Life- or health-critical medical evacuations would experience negligible effects, but visiting physician services could experience long-term, direct, adverse impacts of minor intensity. Regionally, there would be a negligible effect on the number of aircraft accidents. Decreases in automobile traffic between the airport and Jackson would have a beneficial, long-term, indirect impact of moderate intensity on highway safety. Increases in traffic on roads between Jackson and the Idaho Falls Regional Airport would have an adverse, long-term, indirect impact of moderate intensity. Negligible effects would occur with regard to flight operations that provide vital safety links; emergency response services, such as search and rescue and wildland fire fighting; and the handling of hazardous materials.	Direct, long-term, beneficial effects of minor intensity would result from the ability to pay for upgraded navigational aids, safety equipment and training, and refurbishing of infrastructure such as the runway and taxiway. All other impacts would be negligible.

TABLE 5: IMPACTS OF THE ALTERNATIVES (CONTINUED)

Impact Topic	Alternative 1: No Action / Continue Current Agreement	Alternative 2: Preferred Alternative
Socio-economics	Major, long-term, indirect, adverse impacts would occur for the town of Jackson and Teton County, Wyoming. Adverse impacts would also occur in Lincoln County, Wyoming, and Teton County, Idaho. Contributing components would include the following. For recreation outside the park, the intensity would be minor in the summer and major in the winter. The economic impact from on-airport losses of jobs, purchases, and services would be major. The off-airport losses of jobs, purchases, and services would have major impacts. The end of locally available scheduled passenger service would have moderate to major impacts on most local residents and businesses. The loss of more than 90% of the airport's operating revenue and 70% of its funding for facility maintenance and capital improvements would have major adverse economic impacts on the airport. Effects on quality of life would depend on personal perceptions.	This alternative would maintain the area's existing economic and socioeconomic trends, which would result in long-term, direct and indirect, negligible or minor impacts.
Surface and air transportation	Adverse, direct, long-term impacts on visitors who arrive by air would be minor in the summer and major in the winter. Changes in community access by air travel would have major, direct, long-term, adverse effects on residents and the business community in and around Jackson. Impacts on levels of scheduled passenger air service at the Jackson Hole Airport would be major, direct, long-term, and adverse. Major, indirect, long-term, beneficial effects would occur at the Idaho Falls Regional Airport. Until 2033, growth in the air charter sector would have a direct, major, long-term, beneficial effect on general aviation. Closure of the airport would be a major, direct, long-term, adverse effect on all general aviation sectors. Other airports in the region would experience similar gains in general aviation, a major beneficial effect. Long-term, direct highway traffic effects would be moderate and beneficial between the airport and Jackson, and major and adverse between Jackson and the alternate site of air service, Idaho Falls. Highway planning in Wyoming and Idaho also would experience major, adverse, indirect, long-term effects. Improved opportunities to promote public transit would have direct, negligible to moderate, long-term, effects that would be both beneficial and adverse.	Negligible effects would occur because it essentially would maintain the status quo with regard to use of the airport. Current trends with regard to air transportation, use of roads and highways both within and outside the park, and other transportation-related activities such as planning would continue.

Chapter 3
Affected Environment

INTRODUCTION

This chapter describes the existing environment in the vicinity of the Jackson Hole Airport. The emphasis is on natural resources and visitor resources of Grand Teton National Park, park and airport operations, public health and safety, socioeconomics, and surface and air transportation. These topics were selected based on federal laws and regulations, executive orders, NPS and Jackson Hole Airport staff expertise, and concerns expressed by other agencies or members of the public during scoping. The conditions described in this chapter establish the baseline for the evaluation of environmental consequences that is provided in Chapter 4.

The Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act require that the description of the affected environment must focus on describing the resources that might be affected by implementation of the alternatives. Therefore, the description of the affected environment is limited to resources within and outside Grand Teton National Park that potentially could be affected by implementing one or both of the alternatives described in Chapter 2.

NATURAL SOUNDSCAPE

INTRODUCTION

This section addresses the natural soundscape of Grand Teton National Park, and aircraft and other non-natural sound sources. See the "Acoustic Primer" on page 91 for an explanation of acoustic terms and characteristics. Terms also are defined in the glossary in Chapter 6.

The natural soundscape is an important protected and managed natural resource in the park. Aircraft sounds associated with the operation of the Jackson Hole Airport are subject to restrictions under the terms of the 1983 agreement. These topics and their interactions are addressed by this section.

This section addresses the *physical* properties of sound. The "Visitor Use and Experience" section considers how visitors to the park perceive and react to sound associated with airport operations and other sources. The effects of aircraft sound on wildlife are evaluated in the "Wildlife and Their Habitats, Including Special Concern, Threatened, and Endangered Species" section.

THE NATURAL SOUNDSCAPE OF GRAND TETON NATIONAL PARK

One important mission of the National Park Service is to preserve or restore the natural soundscape associated with units of the national park system. Natural soundscapes are valued resources at Grand Teton National Park.

- Section 8.2.3 of *Management Policies 2006* (NPS 2006a) states, "The natural ambient sound level – that is, the environment of sound that exists in the absence of human-caused noise – is the baseline condition, and the standard against which current conditions in a soundscape will be measured and evaluated."
- Section 4.9 requires that "The National Park Service will preserve, to the greatest extent possible, the Natural Soundscapes of parks … [and] will restore to the natural condition wherever possible those park soundscapes that have become degraded by unnatural sounds (noise)."

The natural soundscape of the park varies substantially by location and time. The natural soundscapes varies in settings that extend from the high peaks of the Teton Range to the banks of the Snake and Gros Ventre Rivers and tributary streams. Sound-producing physical processes such as wind and water, and animal sounds change constantly by location and time of day.

- During winter, croaking ravens are a frequent daytime sound. Soft contact calls from chickadees and other small birds mingle with the harsher notes of Clark's nutcrackers and magpies. Sounds associated with branches and trees rubbing against each other, and popping sounds from wood freezing and thawing during very cold periods, are commonly audible within the forested areas of the park. Near the larger bodies of water, the groaning and cracking of frozen lake waters accompany temperature fluctuations.
- Spring and summer bring the return of many more biological sounds of birds, mammals, amphibians, and insects. Sounds from flowing water of rivers, waterfalls, and waves become more prominent, and rain and thunderstorms punctuate many afternoons.

- The bugling of elk and the rustling and falling of dry leaves from deciduous trees mark the end of summer and the beginning autumn natural soundscapes.

Natural ambient sound levels can be very low over much of the park during periods of calm weather and away from running water. As shown in Table 6, the minimum ambient sound levels recorded in most areas of the park that are not near streams are below 25 A-weighted decibels (dBA). The median ambient sound levels around flowing water range from 30 dBA near Beaver Creek west of Moose to 45 dBA near the mountain stream in Cascade Canyon. Typical sound levels of approaching thunderstorms in the park are about 80 dBA, which would be equivalent to the sounds inside the cabin of a cruising jet.

Table 6 shows ambient sound levels and the percent of time that aircraft sounds are audible for selected park locations, based on 41,000 hours of field monitoring. The values in this table are from measurements of sound from all sources, including human-caused sound from visitor activities, highway traffic, transient aircraft, and airport-related aircraft; and natural sounds such as water, weather (for example, wind and thunder), and animals (such as insects and birds).

The first two data columns in Table 6 present all-year and peak-season median ambient sound levels. The median is the middle value, above and below which lie equal numbers of values. The median value is useful because it is not usually affected by the instrument limitations described below. Also, unlike a mean (average), it is not skewed by a small number of very high or low values. The median ambient sound levels range from 22 dBA for winter measurements at Colter Bay Village near Jackson Lake to 47 dBA in Moose Village at park headquarters during the summer. Summer sound levels typically are several dBA higher than those in winter, both because of the increased rustling leaves, buzzing insects, and calls of birds, amphibians, and mammals; and because of increased visitation and visitor activities. At Moose, which is busy year-round, there is little difference in the median sound levels between the summer and all-year periods.

The minimum sound levels that could be measured were often limited by the instrumentation, which produce internal sound and, therefore, could not measure ambient sound levels below 15 to 20 dBA. Monitoring using specialized, low-noise instruments shows that away from running water and under calm wind conditions, natural ambient (without human-made) sounds in the park during the winter were sometimes below 15 dBA and can be near 0 dBA, as shown near Beaver Creek in the Table 6.

Measured sound levels are from below 20 dBA at sites away from water to more than 100 dBA at sites close to machinery, such as motorcycles on roads and aircraft north of the runway. However, even the sites with the highest sound levels can be very quiet when such equipment is not operating.

Interpreting the median ambient sound levels requires considering how often sound occurred and how loud it was. For example, the median ambient sound level in the summer at the sampling point near a stream in Cascade Canyon was nearly twice as loud (45 dBA) as the median ambient sound level north of the runway (36 dBA). However, Cascade Canyon experienced an almost constant sound from running water that never fell below 42 dBA and rarely rose above 46 dBA. In contrast, the airport site just north of the runway is away from visitor activity and running water, and was quieter than 42 dBA except when aircraft flew over at sound levels up to 107 dBA.

The last two columns include percent-time audible for sound from all aircraft, including transient aircraft and aircraft using the Jackson Hole Airport. These values should be considered minimums, because some actual aircraft sounds could not be identified during the analyses and, therefore, were not included in the aircraft totals. This is particularly true during the peak season, when aircraft sounds often are masked by sounds from other human-made sources.

TABLE 6: ACOUSTIC MEASUREMENTS AT SELECTED LOCATIONS IN GRAND TETON NATIONAL PARK [a/]

Park Location	Median Ambient Sound Levels [b/] (dBA)		Range of Ambient Sound Levels [b/] (dBA)		Percent of the Time Aircraft Sounds Are Audible [c/]	
	All Year	Peak	Minimum	Maximum	All Year	Peak
Colter Bay Beach near Jackson Lake [d/]	22	Not available	<21	83	11	Not available
Jackson Lake north (Cow Island)	28	31	<17	86	8	5
Near Signal Mountain next to Teton Park Road	32	41	<20	104	12	8
Cascade Canyon near mountain stream	Not available	45	42	65	Not available	4
Snake River across from Cunningham Cabin	Not available	37	31	90	Not available	8
Near Beaver Creek west of Moose	Not available	30	<7	69	Not available	Not available
Moose Village at park headquarters	46	47	23	96	5	4
White Grass Ranch	29	32	<20	94	24	20
Jackson Hole Airport north of runway [e/]	33	36	<22	107	30	43

a/ These are actual field measurements, not the results from computer modeling that were used in this document's impact analysis. Data are derived from more than 41,000 hours of acoustic data collection from more than 1,600 sample days.
Time of measurement occurred between 7 A.M. and 10 P.M.
Park locations are arranged from north to south.

b/ Includes all natural and human-made sounds. Ambient sound levels during mid-day are generally higher than these data show.

c/ Includes all aircraft, not just those related to the Jackson Hole Airport. NPS monitoring in Yellowstone National Park showed that regionally, sound from transient aircraft was audible between 5% and 10% of the time. Percent of time aircraft are audible depends on highly variable ambient sound levels. Both natural and non-natural sound sources can mask aircraft sounds. All percent of time audible values should be considered minimum values because some actual aircraft sound was not identified as such, especially at the Jackson Hole Airport site.

d/ Winter measurements only.

e/ April through June measurements. June is considered peak for these Jackson Hole Airport data.

ACOUSTIC PRIMER

Commonly Used Terms

Several acoustical terms and concepts commonly used in natural soundscape descriptions and sound evaluations are briefly defined here for the convenience of the reader. More detailed explanations for many of these terms are provided in the glossary in Chapter 6.

Audible – A sound that can be heard by a person with normal hearing. Not all sounds that are audible will be perceived by humans because, for example, people are not present or they are present but are not paying attention to unrelated sounds. Audibility is useful in that it accounts for the sound level and frequency content of both the sound source and ambient sounds.

Day-Night Average Sound Level (variously abbreviated as DNL or Ldn) – An energy-average sound level (Leq), including a nighttime penalty of 10 dBA, that represents the total sound exposure over a specified period of time. Typically, a 24-hour period is used. However, the 15 hours between 7 A.M. and 10 P.M. were used for this analysis to more accurately represent the operations of the Jackson Hole Airport, where night operations are controlled by a voluntary curfew. Therefore, average sound level in this context does not include the nighttime penalty and is defined as a 15-hour Leq (sound level equivalent - see below).

Decibel (variously abbreviated as dB or db) – A sound-level unit measured on a logarithmic scale. The "A-weighted" decibel scale (dBA) is a widely used weighting system that approximates how the human ear responds to sound levels.

Maximum Sound Level (Lmax) – The maximum sound level of a particular event.

Natural Ambient Sound Level – The sound level of the natural soundscape in the absence of human-made sounds.

Natural Soundscape – The combined sounds of nature that exist in the absence of human-made sounds, also sometimes called natural quiet. The natural soundscape, however, is not usually quiet, but includes all natural sound sources such as waterfalls, birds, thunder, and many others.

Noise – Unwanted or extraneous sound.

Percent of Time Audible – The percent of the total period from 7 A.M. to 10 P.M. that aircraft sound related to operations at the Jackson Hole Airport is audible.

Sound Level Equivalent (Leq) – A single sound pressure level over a given time that would have the same total energy of the actual varying sound levels. In this final environmental impact statement, a 15-hour Leq was modeled and reported.

(For this analysis, Leq approximates a true 24-hour DNL. However, the Leq would not include sounds from the uncommon aircraft operations that occurred between 10 P.M. and 7 A.M. and the associated 10-dBA penalty assigned to each night-operation. This difference would result in DNL contours that were slightly larger than the corresponding Leq contours. The airport's acoustic contractor, BridgeNet Solutions, Inc., has been calculating true DNL values based on airport operations each year since the mid-1980s. The DNL contours reported by BridgeNet in its 2005 annual report confirm the similarity with the 15-hour Leq contours for baseline conditions from October 2004 through September 2005 that were modeled in this analysis.)

Time above 60 Decibels (TA60) – The total time that sound levels from aircraft related to operations at the Jackson Hole Airport are above 60 dBA. This is the sound level of a normal conversation at 5 feet, and a level that would likely cause speech interference.

Characteristics of Sound

The decibel (dB) is the basic unit of measure for describing sound levels. Because the human ear responds to a wide, dynamic range of sound pressure fluctuations, decibels are measured on a logarithmic scale.

Most sounds consist of many air pressure frequencies. Because the human ear is not equally sensitive to all frequencies, several frequency-weighting strategies have been developed that approximate how the human ear responds. The "A-weighted" decibel scale (dBA) is the most widely used. For most people:

- A 1-dBA change is just perceptible;
- A 5-dBA change is clearly perceptible; and
- A 10-dBA change is perceived as being half or twice as loud.

Sound levels decrease as the distance between the sound source and the receiver increases. Generally, sound levels decrease by about 6 dB with every doubling of distance from a source. Therefore, as shown in Table 7, when the sound level of a source is specified, the distance from the source also must be given.

Because the decibel scale is logarithmic, individual sound levels from different sound sources cannot be added arithmetically to give the combined sound level of the sources. Specifically:

- Two sound sources that produce equal sound levels will produce a total sound level that is 3 dBA greater than either sound alone.
- When two sound sources differ by 10 dBA, the total sound level will be 0.4 dBA greater than the louder source alone. Therefore when sound sources differ by more than 10 dBA, the quieter sound level can essentially be disregarded when calculating the total sound level. However, sources with non-similar spectral characteristics may still be distinguishable even if their sound levels vary by more than 10 dBA. For example a high-pitched, 35-dBA bird song may be audible near a road with a 50-dBA sound level composed of mostly low-frequency vehicle sounds.

NON-NATURAL SOUND SOURCES IN GRAND TETON NATIONAL PARK

Non-natural sounds generated by human activity are superimposed on the natural soundscape. These non-natural sounds are loudest and most common near road corridors, the Jackson Hole Airport, park developed areas, and lakes. The non-natural sounds in the park include sounds resulting from many summer- and winter-season visitor and administrative activities, utilities in developed areas, wheeled vehicles on roads, motorized watercraft on Jenny and Jackson Lakes, and snowmobiles and motorized ice augers used by ice fishers on Jackson Lake. The sounds in each developed area are determined by its function and use.

TABLE 7: DECIBEL LEVELS OF COMMON SOUND SOURCES [A/]

dBA [b/]	Perception	Outdoor Sounds	Indoor Sounds
130	Painful	Civil defense siren at 100 feet	
120	Intolerable	Jet aircraft at 50 feet	Oxygen torch
110	Uncomfortable	Jet landing at 150 feet	Rock concert
100		Ambulance siren at 100 feet	Folk concert near speakers
90	Very loud	Straight-pipe motorcycle at 45 miles per hour at 50 feet	Hair dryer
80		Approaching thunderstorm	Inside cabin of cruising jet
70	Loud	Snowmobile traveling at 45 miles per hour at 50 feet	Vacuum cleaner
60		Cessna 172 landing, at 1000 feet	Conversation at 5 feet
50	Moderate	Automobile traffic traveling at 35 miles per hour at 50 feet	Office building office
40		Snake River at 100 feet	Living room (no television)
30	Quiet	Snake River at 300 feet	Quiet bedroom
20		Summer wilderness on calm night	Recording studio
10	Barely audible	Faint whisper	
0	None	Threshold of human hearing; winter wilderness	

a/ Source: compiled primarily from Shutt Moen Associates 2002, with tailoring to increase applicability to Grand Teton National Park and the Jackson Hole Airport. Levels without distances refer to typical distances with use.
b/ Decibels are logarithmic and a difference of 10 decibels is perceived as a halving or doubling of loudness.

Sounds from Roads

Road corridors are sources of sounds from automobiles, trucks, motorcycles, and other wheeled vehicles. Road use occurs around the clock, but is much more frequent during the daylight and early evening hours than at night. Sounds from road activity can be audible at distances of several miles, depending on the type of vehicle making the sound, ambient sound level, weather conditions, and surrounding topography. Sound levels are highest immediately adjacent to the road, but the percent of time these sounds are audible can remain high far from the road corridor because of the additive effects of multiple vehicles separated along the travel corridor.

During the summer on U.S. Highway 26/89/191 and along the Teton Park Road, vehicle traffic is often audible nearly 100% of the time during daylight hours. During the summer of 2003, an average of 8.4 vehicles per minute (one vehicle every seven seconds) crossed a traffic counter on U.S. Highway 26/89/191 near the park's south entrance. Further north on the highway, an average of 3.7 vehicles per minute (one vehicle every 16 seconds) traveled along the section from Antelope Flats to Moran Junction. Along the northern section of the Teton Park Road, an average of 2.3 vehicles per minute (every 26 seconds) passed the traffic counter in along that segment (NPS 2005c).

As shown in Table 7, traffic sound levels at 50 feet commonly range from 50 dBA (automobile traffic traveling at 35 miles per hour) to 90 dBA (straight-pipe motorcycle at 45 miles per hour). Trucks have been measured at levels exceeding 80 dBA at a distance of 100 feet. Under typical conditions, sounds from wheeled vehicles generally are audible a half-mile or more from the road. NPS measurements in nearby Yellowstone National Park have found that loud motorcycles can be audible 8 miles from the nearest road.

Sounds from Boat Engines

Many boats with gasoline engines operate on Jackson Lake during the ice-free period. Power boats range from cabin cruisers to speed boats to skiffs, and are audible on and near the lake during much of the daylight period in the summer. Using a 15-hour day from 7 A.M. to 10 P.M., monitoring determined that boat engines were audible at a Jackson Lake island monitoring site 16% of the time on an annual basis and 42% of the time during July and August (NPS unpublished data). On summer days, boat engines are audible almost constantly on Jenny Lake as vessels shuttle people from the east shore to the dock below Inspiration Point on the west shore. Although the four-stroke engines used on the boats are comparatively quiet, engine noise still is audible on and adjacent to the lake.

Sounds from Oversnow Vehicles

During the winter months, oversnow vehicles provide fishing access on Jackson Lake, operate along the Grassy Lake Road, and stage out of Flagg Ranch for trips into Yellowstone National Park. Only four-stroke snowmobiles are allowed on Jackson Lake, and these are audible for 3% or less of the 15-hour day. Snowmobiles use Grassy Lake infrequently and are audible for less than 5% of the 15-hour day. The snowmobiles and snowcoaches that stage out of Flagg Ranch can be audible for 20% of the 15-hour day during the winter (NPS unpublished data).

Sounds from Transient Aircraft not Associated with the Jackson Hole Airport

Transient aircraft that overfly Grand Teton National Park at all altitudes are often audible to listeners on the ground. Sounds from transient aircraft, when not masked by louder natural or non-natural ambient sounds, were audible between 5% and 10% of the time between the hours of 7:00 A.M. and 10:00 P.M. (NPS unpublished data). These sounds are not associated with the Jackson Hole Airport.

Overflights include general aviation aircraft at low or moderate altitudes travelling between points outside the park, and high-flying commercial aircraft. The number of high-flying commercial aircraft that overfly the park is low compared to most areas of the continental United States. For example, even in relatively unpopulated southwestern states, transient aircraft can be audible more than 50% of the time (NPS unpublished data).

Sound levels from transient aircraft depend on many factors, such as aircraft type, altitude, distance from the observer, slant angle relative to the observer, and engine power settings. Aircraft sounds are typically loudest when the aircraft is passing directly overhead, although this can be influenced by other factors, including atmospheric conditions such as temperature profile, humidity, and wind. Additionally, sound perception is affected by the topography on the ground (such as a hard-sided canyon or nearby rock cliff that can amplify the sound), or can be attenuated by such features as wind direction and speed. NPS-measured sound levels from audible transient aircraft generally are between 20 dBA to 40 dBA. Maximum sound levels are in the low 50-dBA range.

Sounds from Aircraft Used for Administrative Purposes

Two contracted helicopters are stationed at the interagency helibase within the Jackson Hole Airport boundary. In addition, the National Park Service and other federal and state agencies use fixed-wing aircraft and other helicopters that overfly the park to assist with research, search and rescue, fire, radio maintenance, and other purposes. During 2009, there were about 600 operations of these aircraft with a total flight time of 220 hours over Grand Teton National Park.

Sounds from Jackson Hole Airport Use – Background and Historical Issues

The Jackson Hole Airport is the only airport in the nation that provides scheduled air carrier service that is entirely within the boundaries of a national park. As such, it has a long history of controversy concerning its development and operation. The 1983 agreement between the Department of the Interior and Jackson Hole Airport Board (provided in Appendix C) was developed with this in mind and includes a number of provisions to ensure that the airport remains compatible with the purposes of the park. The noise abatement plan that was implemented by the Jackson Hole Airport Board in 1985 (see Appendix D) has been effective in ensuring that the operation of the airport has not resulted in noise impacts greater than those allowed under the agreement.

The key provisions in the agreement regarding noise exposure are restrictions on single-event and cumulative noise impacts. Specifically, the airport may not exceed specific day-night average sound levels (DNL) at key locations in the park.

- Airport operations are not allowed to generate annual noise levels exceeding the 45-decibel DNL contour west and north of a restriction line described in the agreement and shown on Figure 2.
- Airport operations must not generate an annual 55-decibel DNL noise contour that extends into noise sensitive areas of the park that are defined in the 1983 agreement and shown on Figure 2.

No other airport in the nation is believed to have such stringent noise requirements.

Failure to comply with these requirements would be considered a material breach of the agreement. Compliance with these requirements is determined through modeling with the Federal Aviation Administration's Integrated Noise Model and is validated by measurements taken at a noise monitoring site in Moose. Additional noise monitoring sites in the park are located at 4 Lazy F, Barker, and Timbered Island. Sites outside the park are at Jackson Hole Golf & Tennis and on Moulton Loop.

The agreement also includes a single-event limitation that prohibits the operation of any aircraft with a noise level of greater than 92 dBA on approach, as listed in Federal Aviation Administration Circular 36-3B or the version of that document currently in effect. The requirement effectively prohibits the operation of any aircraft that produces higher noise levels than the Boeing 737-200 aircraft that were operating at the time the agreement was signed. With the advent of the stage classification for aircraft noise levels (see the explanation of Stage 1, Stage 2, and Stage 3 aircraft in the glossary), not all aircraft are listed in the circular. Aircraft not listed in the circular are allowed to operate if they would meet the noise limits when tested in accordance with Federal Aviation Administration procedures.

These requirements were included in the 1983 agreement to ensure that there would be "no significant increase in cumulative or single event noise impacts on noise sensitive areas of the park." The agreement did not state explicitly what was meant by the term "no significant increase," but the environmental assessment that provided National Environmental Policy Act compliance for the agreement (NPS 1983) specified that the phrase was intended to have the meaning defined by the Federal Aviation Administration in its environmental compliance procedures. That agency's use of that term relates to increases in sound on noise-sensitive areas within the 65-decibel DNL contour. By prohibiting even the 55-decibel DNL contour from extending into noise-sensitive areas of the park, the agreement does not allow such a "significant increase" in noise to occur.

As required by the 1983 agreement, the Jackson Hole Airport Board updated the airport's noise abatement plan in accordance with Title 14, Part 150 of the *Code of Federal Regulations* (Part 150). The revised plan, which is in Appendix D of this final environmental impact statement, was approved by the Federal Aviation Administration and adopted by the Board on March 14, 1985.

To ensure compliance with the agreement's DNL contour requirements to control cumulative noise, the noise abatement plan established a limit on the number of commercial jet operations. The limit was 6.5 average daily departures averaged annually, and 6.85 average daily departures averaged each calendar quarter, for the Boeing 737-200, a model that was then in operation at the airport. Greater numbers of operations are allowed only if quieter aircraft are used, based on an equivalency formula.

The airport's Part 150 study included a map showing the noise contours that existed in 1984. The contours from that map are provided in Figure 4.

To demonstrate its compliance with the noise requirements of the 1983 agreement, the Jackson Hole Airport Board has prepared comprehensive noise measurement reports every year since 1986. The reports include the results of noise measurements, as well as modeling, to compare and summarize the noise exposure in the park resulting from the airport. A copy of the most recent report is available on the Internet at <www.nps.gov/grte/parkmgmt/planning.htm>.

A comparison of the noise contours from 1984 and 2008 that are provided in Figure 4 shows that the DNL noise contours have decreased in area since 1984. The 2008 contours are similar in shape and size to the year 2005 15-hour Leq contours that were modeled independently for this final environmental impact statement (see Figure G-21 in Appendix G).

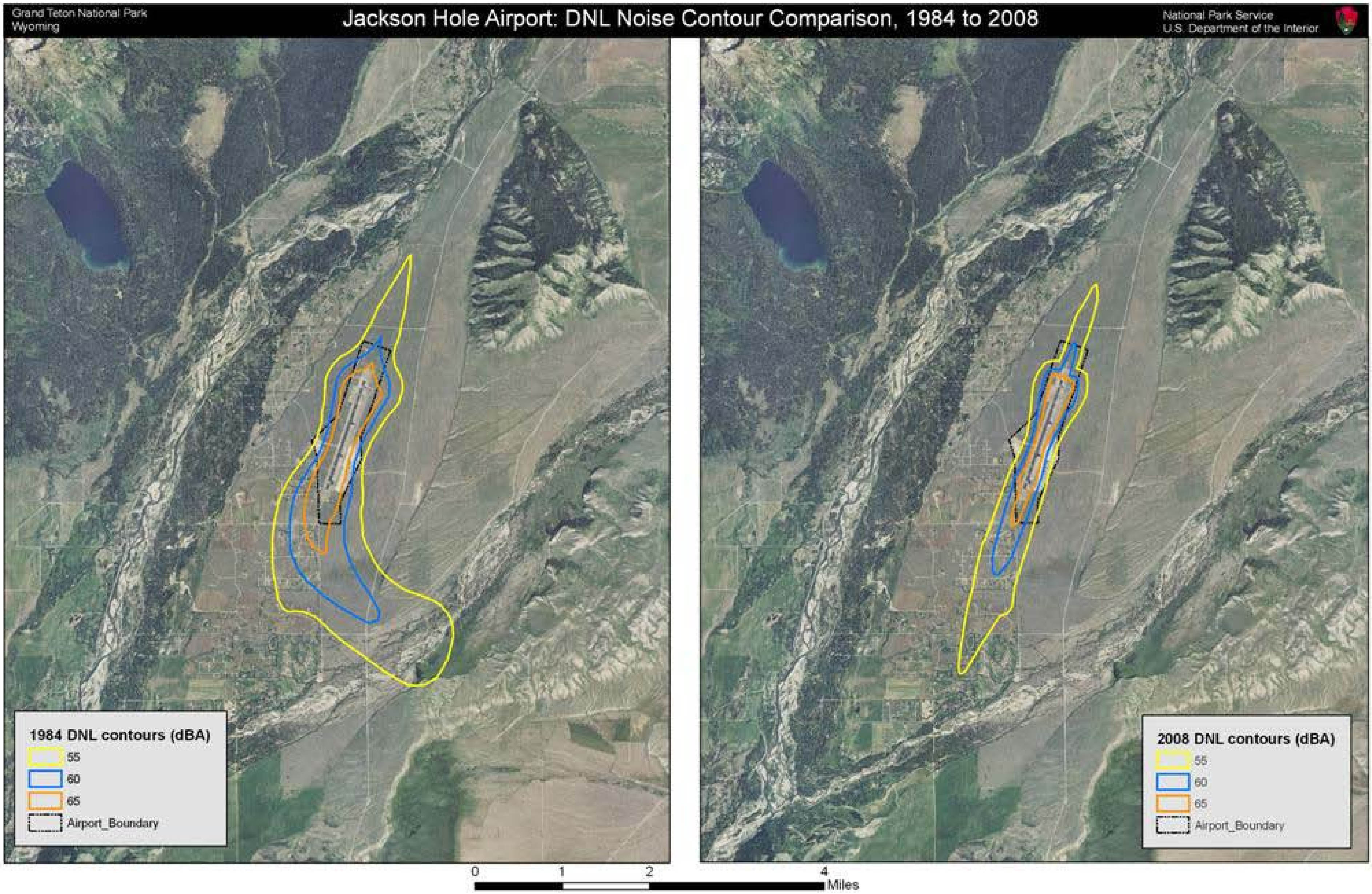
The decrease in size of the DNL noise contours has occurred despite an increase in the number of enplanements and aircraft operations over the past 25 years. According to the 1985 Part 150 study, in 1984 there were 62,909 passenger enplanements at the Jackson Hole Airport, and 18,036 aircraft operations. Of the total operations, about 5,000 were air carrier or commuter and 13,000 were general aviation. In 2009, there were about 290,000 enplanements and 29,003 operations. Of the total operations, about 7,500 were scheduled passenger carriers, 21,300 were general aviation or air taxi, and 150 were military.

The primary reason for the decrease in DNL noise exposure has been the transition to quieter Stage 3 aircraft that were only beginning to come into service in 1983 (Jackson Hole Airport Board 2009). At the time the Jackson Hole Airport Board developed its noise abatement plan, none of the airlines serving the Jackson Hole Airport had taken delivery of the newer Stage 3 aircraft (Jackson Hole Airport Board 1997). Because the use of all Stage 2 aircraft has been prohibited at the Jackson Hole Airport since 2005, all jet aircraft operating at Jackson Hole today are Stage 3.

Sound from Jackson Hole Airport Use – Existing Conditions

Machinery used in ground operations contributes to airport-related sound. Maintenance and service vehicles operate year-round, and increased sound levels result from winter snowplowing. Utilities and parked aircraft with operating generators add to the non-natural sounds in the immediate vicinity of the airport. Cars, buses, and trucks associated with airport operations and passenger transport have a more widespread impact as they travel to and from the airport on park roads. Airport ground activities create sounds that often are perceptible several miles from the airport. At White Grass Ranch, about 4 miles away, airport ground operations can be audible during much of many days, especially in winter when natural ambient sound levels are lower than in other seasons.

FIGURE 4: COMPARISON OF DAY-NIGHT AVERAGE SOUND LEVEL NOISE CONTOURS AT THE JACKSON HOLE AIRPORT IN 1984 AND 2008



The loudest sounds associated with the Jackson Hole Airport result from aircraft starting up, taxiing, taking off, and landing. Jackson Hole Airport operations include scheduled air carrier and regional carrier passenger service; general aviation and air taxi (charter and fractional ownership); and flights by the National Park Service and other agencies for research, rescue, fire operations, and other land management purposes.

Figures 5 through 7 visually summarize some of the features of operations at the Jackson Hole Airport. The figures are not all directly comparable, because data are from different years (2009 or 2010), but they are useful in demonstrating the patterns that recur each year.

- Figure 5 shows the variation in daily operations during the 2009 peak season. Daily operations ranged from about 70 to almost 230 (on a mid-August day). The airport averaged 135 operations per day for the three-month peak season.
- Figure 6 uses 2010 data to show the average number of operations that occurred by hour of the day during the peak-season month of July. These values recently became available from the airport's new Air Traffic Control Beacon Interrogator-6 aircraft tracking system. Over the 15-hour day, the data demonstrate a peak in operations centered at noon, a smaller peak in late afternoon, and almost no operations between 10 P.M. and 6 A.M. Throughout that month, there were an average of 7.1 operations per hour for the 15-hour day, with a peak of about 11 operations during the noon hour.
- Figure 7 illustrates the distribution of operations per day by month in 2009. For that year, this resulted in an average of 79 operations per day. The summer peak, secondary peak during the ski season, and decreases during the tourism off-seasons in spring and fall all are apparent.

FIGURE 5: NUMBER OF OPERATIONS BY DATE, JACKSON HOLE AIRPORT, PEAK SEASON, 2009
Source: Jackson Hole Airport tower logs.

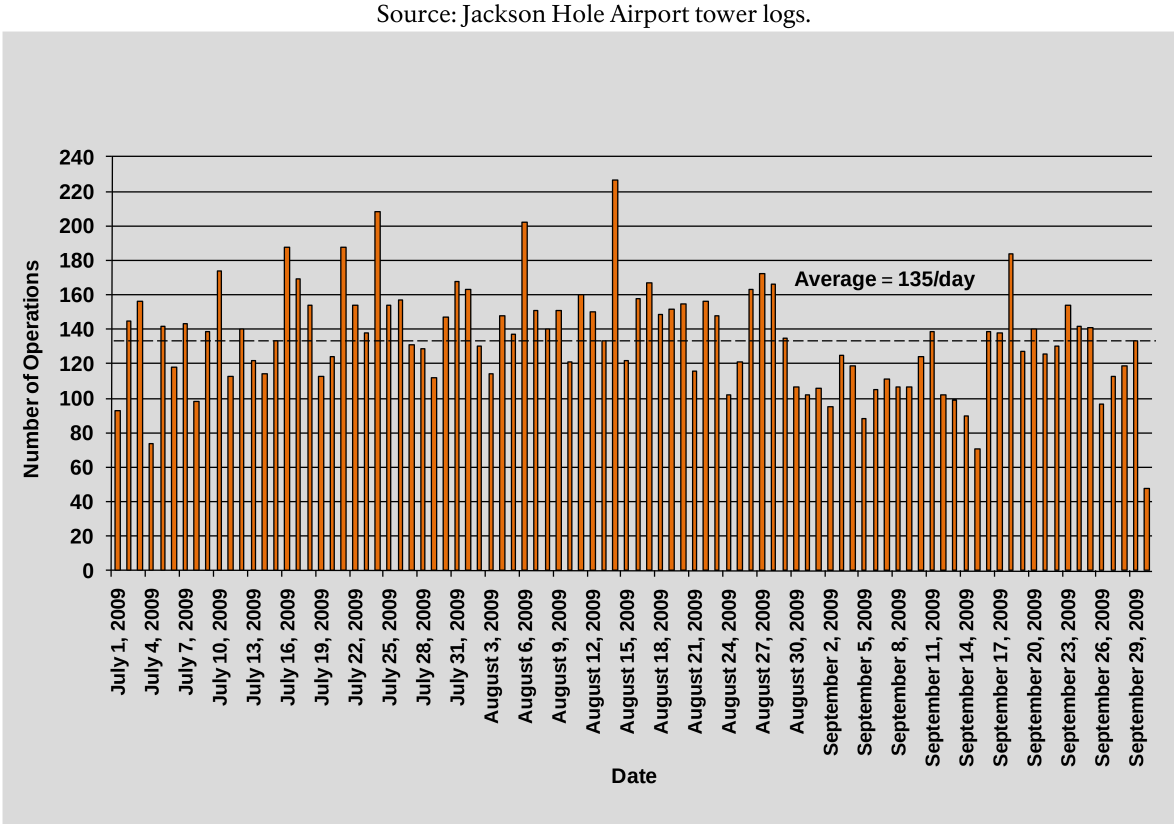


FIGURE 6: AVERAGE OPERATIONS BY HOUR AT THE JACKSON HOLE AIRPORT IN JULY 2010
Source: Jackson Hole Airport Air Traffic Control Beacon Interrogator-6 aircraft tracking system.

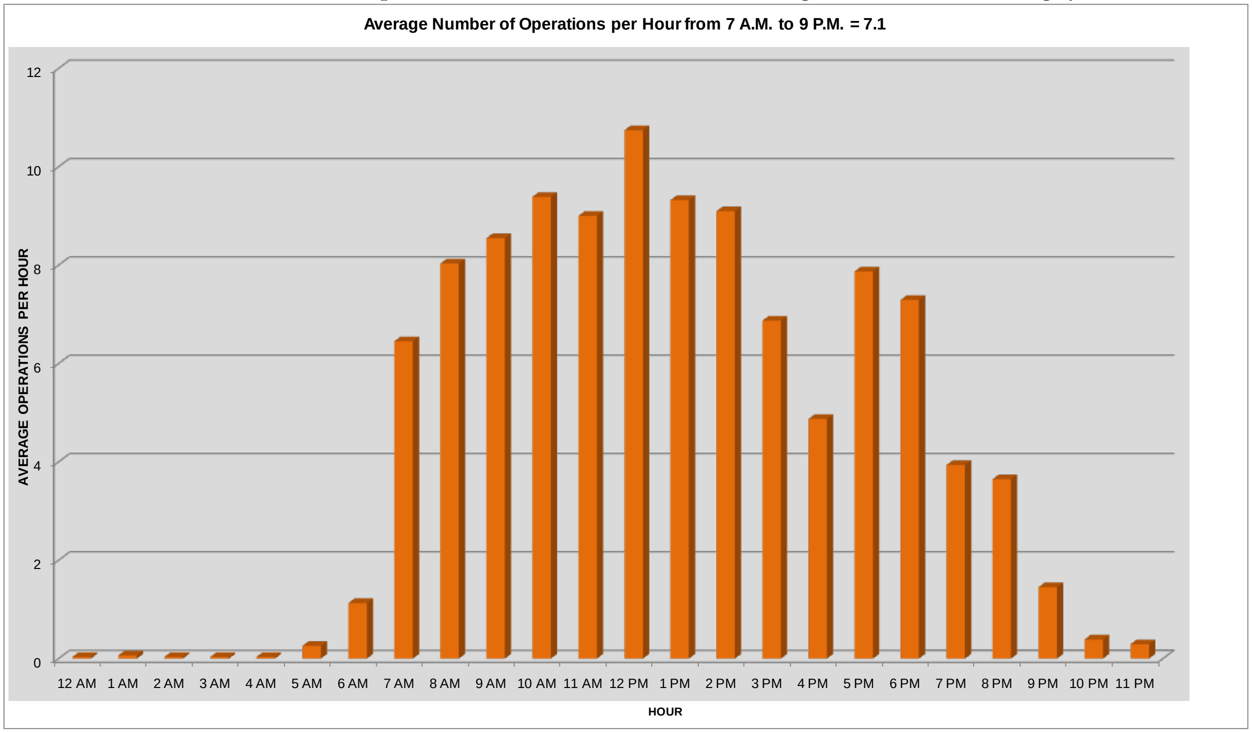


FIGURE 7: AVERAGE DAILY OPERATIONS BY MONTH, JACKSON HOLE AIRPORT, JANUARY THROUGH DECEMBER 2009
Source: Jackson Hole Airport tower logs.

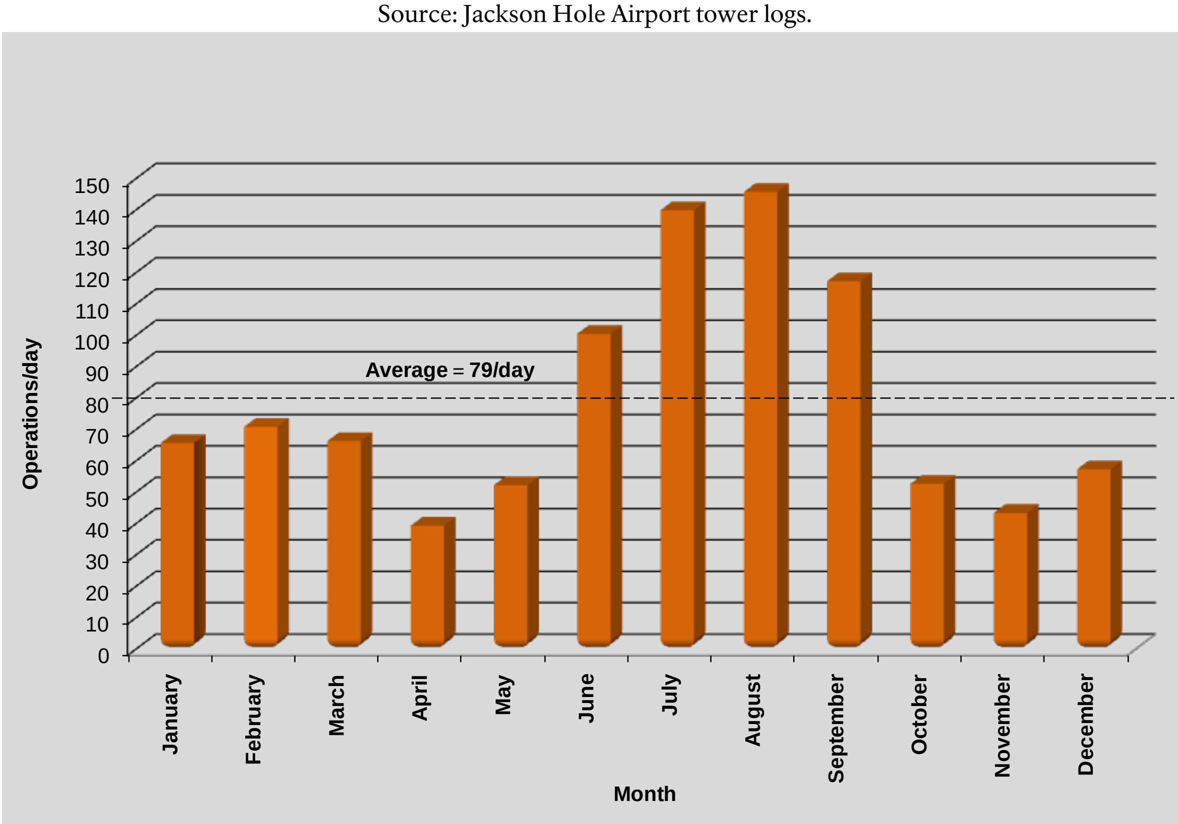


Table 8 provides a summary of the 33,005 operations from October 2004 through September 2005 that were used as the base year in the modeling for the impact analysis. During this period, the airport averaged 90 operations per day on an all-year basis, and in the summer peak season it handled about 150 daily operations.

TABLE 8: SUMMARY OF OPERATIONS AT THE JACKSON HOLE AIRPORT, OCTOBER 2004 THROUGH SEPTEMBER 2005 [a/]

Aircraft Type	Actual Annual	Average Daily [b/]
Air carrier/regional carrier		
Airbus 319/320	1,892	5.2
Boeing 737	982	2.7
Boeing 757	630	1.7
CRJ 700	228	0.6
Dash 8	1,540	4.2
Embraer 120	3,147	8.6
Subtotal	8,419	23.0
General aviation [c/]		
Astra 1125	501	1.4
Baron 58P	268	0.7
Cessna 172R	3,921	10.7
Cessna 206H	234	0.6
Challenger	916	2.5
Citation Bravo 550	4,664	12.8
Citation III	505	1.4
Citation X	1,005	2.8
Conquest II	432	1.2
Dash 6	3,147	8.6
Diamond I MU 300-10	50	0.1
Embraer 145 ER	3,412	9.4
Gulfstream IV	1,715	4.7
Lear Jet 35/36	2,961	8.1
Single-engine, fixed-pitch propeller	237	0.7
Single-engine, variable-pitch propeller	618	1.7
Subtotal	24,586	67.4
Total	33,005	90.4

a/ Source: Unpublished operational records from the control tower at the Jackson Hole Airport.
b/ Some values may be slightly off because of rounding.
c/ Includes unscheduled charter and air taxi.

The fleet mix using the airport varies monthly and yearly so that the aircraft types in Table 8 should be considered representative. This variability is based on factors such as economic conditions, changes in airline fleets and equipment, introduction of new aircraft and retirement of older planes, load factors, owner preferences, and fuel prices. The number of operations also varies by year, and has declined from the 2004-2005 level to about 29,000 in 2009. Through July 2010, operations were about 12% lower than the corresponding period in 2009.

Within the general aviation category, which includes the air taxi operations that are conducted under the requirements for commuter and on-demand operations in 14 *Code of Federal Regulations* Part 135, many more types of aircraft used the airport than are shown in the table. The fleet mix shown in the table and used in the modeling was developed through a review of the air traffic control tower logs, discussions with tower personnel, airline representatives, the fixed base operator, and the best professional judgment of the modelers to accurately represent the operational profile of the airport, while accounting for the jet, turboprop, and piston operations for which the specific aircraft type could not be obtained.

On average, the number of arrivals at the airport equals the number of departures. Most of the departures use Runway 19 (southbound) and leave the park's airspace almost immediately upon becoming airborne. About 15% of arrivals use Runway 01 (northbound), which enables them to almost entirely avoiding overflight of the park. Therefore, about 50% of the total operations effectively avoid overflight of the park. Nevertheless, these aircraft operations result in noise impacts in the park because of the location of the airport within the park boundary. Of the remaining 50% of operations, many of the arrivals on Runway 19 arrive from the south and/or east and use a short final approach of less than 5 miles, rather than the entire localizer approach from the southern end of Jackson Lake.

Flight tracks for a random sample of jet aircraft arriving at and departing from the Jackson Hole Airport during the period from January through July 2010 are provided in Appendix G, Figures G-32 and G-33. The tracks represent data from the Federal Aviation Administration's Air Traffic Control Beacon Interrogator-6 aircraft tracking system at the airport.

COMPUTER MODELING TO ESTIMATE SOUND IMPACTS FROM AIRCRAFT USING THE JACKSON HOLE AIRPORT

Acoustic Metrics

The amount of sound at any park location from an airport-related aircraft is based on a combination of many factors. Some of these include the length of time the sound is audible, sound-level profile (that is, the sound over time as the aircraft approaches and recedes), maximum sound level, pitch, timing, and sound quality. While each of these metrics can provide partial acoustic information on the effect of aircraft operations, none individually provides a complete depiction of the sound.

The science of measuring and evaluating acoustical impacts in natural areas is a relatively new, evolving field. Traditional measures for airport noise relied on community annoyance standards using day-night average sound levels (DNL). In contrast, the National Park Service needs to assess chronic and transient acoustic impacts on park visitors, park wildlife, and other natural resources, including the natural soundscape.

Based on consultation with the NPS' Natural Sounds Program, this environmental impact statement used a combination of the:

- Energy-based metrics of energy-average sound level (Leq) for the 15 hours between 7 A.M. and 10 P.M. and maximum sound level;

- Time-based metrics of percent-time audible and time above 60 dBA; and
- Area-based metric of percent of the park affected by audibility.

Additional metrics that would provide different details regarding the park's soundscape, such as time above 45 dBA and 52 dBA, alerting distance, and listening area reduction, are beginning to be used for some environmental analyses. Appendix G describes the acoustic metrics that were considered for this analysis, some advantages and disadvantages of each, and why the selected metrics were used.

Audibility includes many important acoustic attributes. It is determined, in part, by the ambient sound level, the sound level of the source, the hearing ability of the receiver, and the frequency content (pitch) of the sound. Because this metric captures so many attributes, the impacts of aircraft operations and the natural soundscape thresholds in this analysis are based on audibility.

Modeling Existing Airport Sound to Establish a Baseline

Current aircraft operations can be measured directly, but future impacts can only be estimated using computer modeling. To provide an equivalent basis for comparison, the data in Table 8 from 2004-2005 were modeled as a baseline. Appendix G provides a discussion of model results compared to field measurements. A comparison of modeled and measured results at selected sites in Grand Teton National Park is presented in Figure G-31, and show generally good correlation.

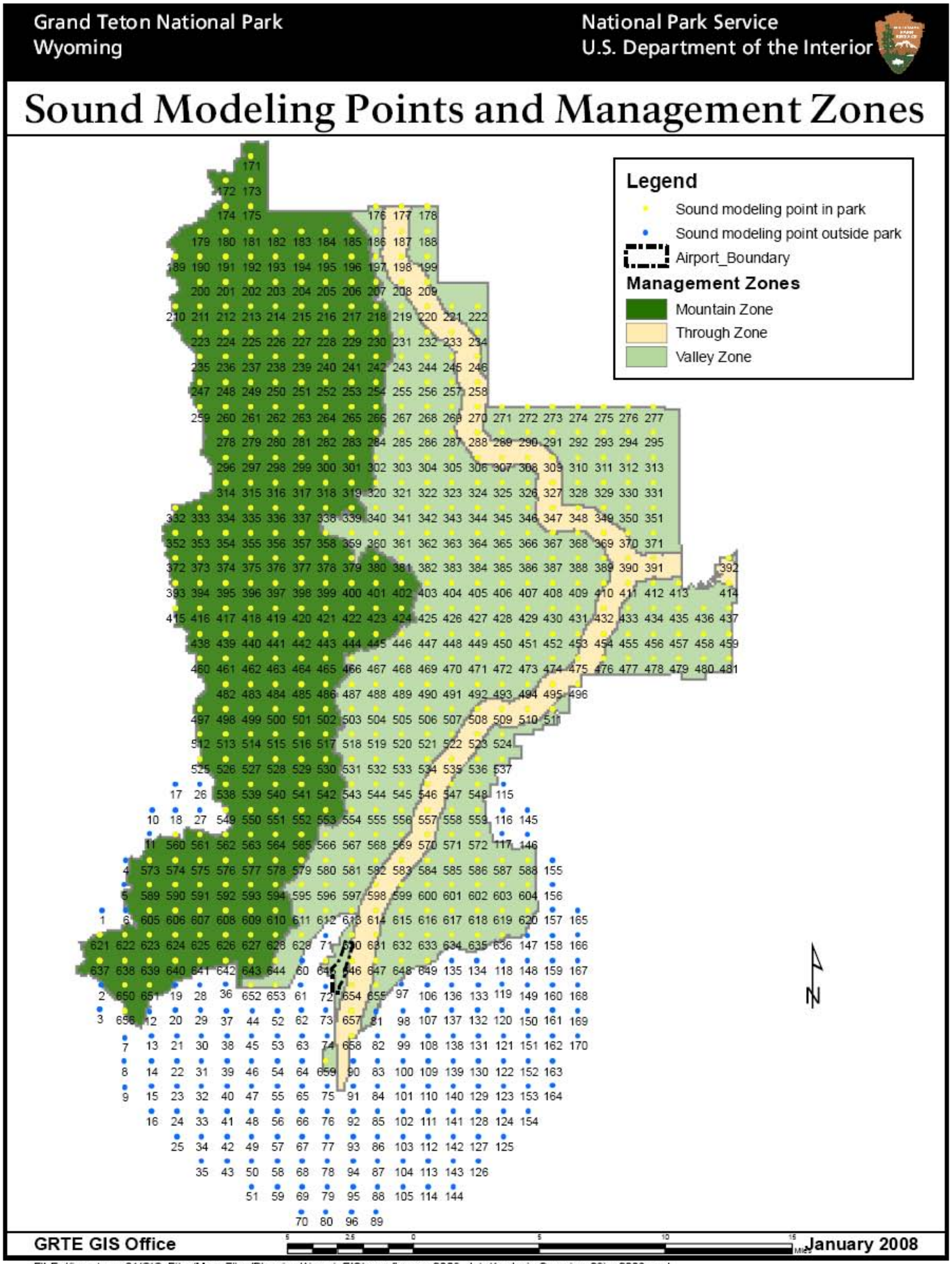
The modeling was used to estimate acoustic effects of airport-related aircraft operations at 659 points, shown in Figure 8. These points, 1 mile apart, are the section corners from the U.S. Geological Survey topographic maps of the area. All are in Grand Teton National Park (489 points) or outside the park within 10 miles of the runway center-point (170 points). Because the grid includes such a large number of modeled points, the percent of points within a specified park area is representative of the percent of the park in that area. Therefore, the analysis refers interchangeably to the percent of points or percent of park affected, depending on context.

At each point, the Federal Aviation Administration's Integrated Noise Model version 6.2a was used to calculate the acoustic metrics of:

- Leq (the energy-average sound level);
- Maximum sound level;
- Percent-time audible (in the park only); and
- Percent time above 60 dBA.

Additional details of the modeling approach and a comparison to measurement data are provided on page 214 under the heading "Modeling with the Integrated Noise Model" and in Appendix G. Appendix G also describes the assumptions that were used in modeling and identifies the limitations that can affect the ability of the model to represent actual conditions. Modeled values for each point shown on Figure 8 are available in tabular form on the Internet at <www.nps.gov/grte/parkmgmt/planning.htm>. under the headings "2005 Soundscape Data, Year-round soundscape data (from modeling)" and "2005 Soundscape Data, Peak Summer soundscape data (from modeling)."

FIGURE 8: GRAND TETON NATIONAL PARK
MANAGEMENT ZONES AND SOUND MODELING POINTS



FILE: //inpgrtegus01/GIS_Files/Map_Files/Planning/Airport_EIS/new_figures_2008_data/Analysis Overview 29jan2008.mxd

To illustrate the impact of airport-related aircraft on the park's soundscape, the following maps show modeled aircraft percent-time audible and time above 60 dBA for the base year 2005:

- Figure G-1: 2005 Percent-Time Audible for Average-Annual Condition;
- Figure G-6: 2005 Percent-Time Audible for Peak-Season Condition;
- Figure G-11: 2005 Time above 60 Decibels (60 dBA) for Average-Annual Condition; and
- Figure G-16: 2005 Time above 60 Decibels (60 dBA) for Peak-Season Condition.

Percent of time audible data were not available for locations outside the park. However values were interpolated through ArcGIS software for some areas outside the park to provide a more clear representation.

Modeled sound intensity, expressed as the 15-hour Leq, is presented in the following figures:

- Figure G-21: 2005 15-Hour Sound Energy Level (dBA) for Average Annual Condition; and
- Figure G-26: 2005 15-Hour Sound Energy Level (dBA) for Peak-Season Condition.

As shown in the figures, sound from airport-related aircraft is audible over a large part of Grand Teton National Park. Although the intensity of the sound impact is high in the immediate vicinity of the airport, it drops rapidly as distance increases.

Maximum Sound Levels

The figure on page 230 in the Alternative 1 impacts analysis in Chapter 4 summarizes the modeled maximum sound levels (Lmax), or loudest sound associated with airport-related aircraft, from year 2005 aircraft operations at each of the 489 points in the park. These values represent the moment of maximum loudness and do not include a duration element. The modeled maximum sound levels may not occur every day, because an aircraft that produces the highest sound level may fly the route closest to any particular point only occasionally.

Because the maximum sound levels are based on characteristics of a particular aircraft flying a particular route, they do not vary with the number of operations of that aircraft. As a result, if the fleet mix and routes do not change, the all-year and peak-season values of the maximum sound levels are the same.

The values in the figure show that:

- The instantaneous maximum modeled aircraft sound was 60 dBA or greater at 22% of the points in the park.
- The loudest aircraft sounds exceeded the sound levels typically occurring in an office setting (50 dBA) in half the park.
- Sound levels of more than 80 dBA occurred at about 1% of the points in the park (five points). All of these were under the flight path close to the runway.
- Sound that can be uncomfortably loud (up to 102 dBA) occurred at one of those points, at the end of the runway.

Percent of Time Audible

The figure on page 228 in the Alternative 1 impacts discussion in Chapter 4 presents the percent of time audible distribution in the park for aircraft from 2005 airport operations during the airport peak season of July through September. The values in the figure show that:

- Sound from airport-related aircraft was audible at about 71% of the points in the park.
- During the peak season when aircraft arrivals and departures were most numerous, aircraft using the airport were audible less than 5% of a day (three minutes each hour) at about 60% of the points in the park and less than 10% of a day (or six minutes each hour) at about 75% of the points in the park. On an all-year basis (not shown in the figure), these values were 67% and 81% of the points in the park, respectively.

On an all-year basis, at the 22 highest percent-time-audible points (4.5% of 489 points), all of which are close to the runway directly along the flight path, aircraft were audible up to 30% of the day (or 18 minutes each hour). During the July-through-September peak season, aircraft were audible for the longest time (45% of the day or 27 minutes each hour) at three points, all of which were in the immediate vicinity of the airport.

Time above 60 dBA

The figure on page 231 in Chapter 4 shows the modeled time above 60 dBA for peak-season time periods for 2005. Data are presented as total minutes within the daily, 15-hour period of airport operations. The sound level of a normal conversation at 5 feet, 60 dBA, was chosen as the loudness at which most visitors would not only be aware of the sound, but might alter their actions, ranging from pausing a conversion as an aircraft passed over to choosing another site to recreate. (A discussion on visitor reactions to aircraft sound is included later in this document under "Visitor Use and Experience.") For time above 60 dBA, there was little difference between the peak-season values shown in the figure and all-year. Data from the peak season indicate that:

- At about 14% of the points in the park, modeled aircraft sound of 60 dBA or greater was audible for at least 0.1 minutes (6 seconds) of the day.
- At about 3% of the points in the park, airport-related aircraft sound was above 60 dBA for more than one minute per 15-hour day. At 1% of the points in the park, it was above 60 dBA for more than five minutes per 15-hour day.
- The maximum time for airport-related sound levels above 60 dBA occurred at the analysis point closest to the runway center-line, where aircraft sound was above 60 dBA for 26 minutes per 15-hour day during the peak season.

Energy-Average Sound Level (Leq)

The Leq for all-year and the July-through-September peak season are shown in Figures G-21 and G-26, respectively, in Appendix G. During all-year and peak-season conditions, the 70-dBA average sound level contour is within the airport boundary. Under peak-season conditions, the 65 dBA average sound levels contour extends outside the airport boundary to the southwest for less than a quarter mile. Average sound levels are below 45 dBA throughout the park and nearby lands except in a corridor about a mile wide surrounding the runway and flight path and extending about 4 miles from the north end of the runway and about 6 miles from the runway's south end.

EFFECTS OF THE AIRPORT ON NATURAL SOUNDSCAPES IN RECOMMENDED WILDERNESS

Grand Teton National Park has no designated wilderness, but has 146,355 acres of recommended wilderness. The recommended wilderness mostly aligns with the park's master plan Mountain Zone area (NPS 1976), which is mapped in Figure 8, along the Teton Range. There are small differences between the boundaries of the recommended wilderness and Mountain Zone, including 6,257 acres (4% of the park) in the northeast corner of the park that are in the recommended wilderness but outside the Mountain Zone. In the south part of the park, two sound modeling points in the Mountain Zone are not in the recommended wilderness and two points in the recommended wilderness are not in the Mountain Zone. None of these differences would change the conclusions for this analysis and, therefore, the effects on the recommended wilderness area will be considered the same as those for the Mountain Zone.

Based on modeling, baseline effects in recommended wilderness included the following.

- Throughout this area, the acoustical effects from airport-related aircraft diminished as the distance from the airport and the flight routes increased.
- The maximum modeled sound level in the recommended wilderness using 2004-2005 data for the Jackson Hole Airport ranged from 11 dBA to 58 dBA.
- No part of the recommended wilderness had modeled time above 60 dBA. Three points (1% of the Mountain Zone) were above 20% of time audible, with the highest value at 24% of time audible. Nine points (4% of the Mountain Zone) were above 15% of time audible, and 15 points (7% of the Mountain Zone) were above 10% of time audible.
- Airport-related aircraft audibility was zero at 116 points (52%) in the recommended wilderness.

SOUND LEVELS OUTSIDE GRAND TETON NATIONAL PARK

The south end of the Jackson Hole Airport runway is close to the park boundary, and sound from airport use extends into private and public lands outside the park. The Jackson Hole Airport conducts sound monitoring at six locations around the airport. The results are available on the Internet through the Jackson Hole Airport web site (<www.jacksonholeairport.com>) sound monitoring page or directly at <http://maps.airportnetwork.com/JAC>.

Model results were produced for the 170 sites outside the park that are within 10 miles of the runway center-point (see Figure 8). The modeled 15-hour energy-average sound levels (Leq) for these areas for all-year and peak season conditions, respectively, are included in Figures G-21 and G-26 in Appendix G. Characteristics of airport-related aircraft sound in these areas include the following:

- The highest modeled sound effects occur at the three points directly south of the runway on private land, and at a topographic high point to the southeast in the Bridger-Teton National Forest. The maximum modeled sound level outside the park is about 92 dBA.
- As shown in Figure G-26, in the peak season, the modeled 65-dBA Leq contour extends slightly into private land beyond the airport boundary. It is contained within the airport boundary on an all-year basis (Figure G-21). The modeled 60 dBA contour extends about a mile beyond the boundary, and decreasing Leq contours occur primarily parallel to and east of the Snake River.
- For existing all-year and peak-season conditions, about 63% of the modeled locations outside the park experience maximum sound levels of 60 dBA or higher.

- For existing all-year conditions, about 87% of the modeled locations typically have cumulative aircraft sound at or above 60 dBA for less than a minute during the daily 15-hour period of airport operations. The highest value for cumulative time above 60 dBA is 17 minutes per day at two points south of the runway.
- For the existing peak season, about 84% of the modeled locations typically have cumulative aircraft sound at or above 60 dBA for less than a minute during the daily 15-hour period of airport operations. The highest value for cumulative time above 60 dBA for the peak-season months is about 26 minutes per day at two points south of the runway.

VISITOR USE AND EXPERIENCE

INTRODUCTION

This section describes park visitors and visitation patterns at Grand Teton National Park, and considers visitor activities, attitudes, and other factors important to understanding the impacts of the Jackson Hole Airport on opportunities for enjoyment of the park.

PARK VISITATION

Over the last 10 years, annual recreational visits to Grand Teton National Park have ranged between 2.3 million and 2.7 million, with 2.6 million visits recorded in 2009. In addition to recreational visits, each year the park experiences approximately 1.5 million non-recreational visits, primarily consisting of people traveling through the park on U.S. Highways 26, 89, 191, and/or 287. While there may be some recreational component to these visits, their primary purpose is to travel through the park to another destination (NPS 2007a, 2009).

In 2009, approximately 78% of all recreational visits occurred during the period June through September. By contrast, the six-month winter period of November through April collectively accounted for about 10% of annual recreational visitation to the park. The remaining approximately 10% of visits occurred during the shoulder-season months of October and May (NPS 2009). The 2009 pattern is typical of the annual visitation pattern at the park.

For many summer visitors, Grand Teton National Park is one of several destinations as part of a larger visit to the greater Yellowstone area (Braak *et al.* 2009). Yellowstone National Park, the surrounding national forests, attractions in Jackson Hole, the town of Jackson, and other destinations are often part of such a visit. In winter, visits to Grand Teton National Park are often secondary or incidental to other activities, such as skiing at one of the three nearby ski areas or a snowmobile or snowcoach trip into Yellowstone National Park.

A visitor survey conducted in the park during July 24 through October 26, 2001 by the University of Idaho found that 42% of visitors spent less than a day in the park. Just over a quarter of the visitors (26%) spent 2 to 3 days, and about 7% reported staying from 7 to 13 days (Smaldone 2001).

In 2005, there were approximately 482,000 overnight stays. Of these, about 44% were at lodges, including Dornan's (12 units) at Moose, Jenny Lake Lodge (37 units), Signal Mountain Lodge (79 units), Jackson Lake Lodge (385 units), and Colter Bay Cabins (166 units). Just over 50% of overnight stays were in tents or recreational vehicles in the campgrounds at South Jenny Lake (50 sites), Signal Mountain (87 sites), Colter Bay (350 sites), Lizard Creek (61 sites), and Gros Ventre (372 sites). Backcountry camping accounted for about 5% of all overnight stays (NPS 2007a).

VISITOR ACTIVITIES AND ATTITUDES

A survey of park visitors in July 1997 (Littlejohn 1998) found that the most common visitor activities included viewing scenery (engaged in by 98% of visitors), viewing wildlife (88%), driving for pleasure (71%), hiking (63%) and stopping at roadside exhibits (59%). The most common reasons identified by visitors as their reasons for visiting the park included sightseeing (87%), viewing wildlife (75%), experiencing wilderness and open space (62%), enjoying recreation (50%), and enjoying solitude or quiet (45%).

In a survey conducted in 2001 by the University of Idaho (Smaldone 2001), the most common visitor activities were sightseeing (engaged in by 88% of visitors), wildlife watching (71%), day hiking (54%), birding (35%), contemplation (34%), and picnicking (32%) The most commonly cited qualities that visitors wanted to see preserved in Grand Teton National Park were naturalness/beauty (34% of responses), wildlife (19%), large expanses of undeveloped land (8%), and the cleanliness and purity of the area (5%).

Most visitors said that there were specific places in the park that were special to them, or to which they were attached (53%). The five most frequently mentioned places included Jenny Lake, Jackson Lake, the Snake River, the Signal Mountain area, and Cascade Canyon (Smaldone 2001). Other locations that regularly attract visitors include Colter Bay Village, Moose Village, Jackson Lake Lodge, the Moose-Wilson Road, Signal Mountain Summit Road, Flagg Ranch, String Lake, the Antelope Flats / Kelly area, Cunningham Cabin, the Menor's Ferry / Chapel area, and the Two Ocean / Emma Matilda Lakes area (Littlejohn 1998).

FACTORS INFLUENCING VISITOR USE AND EXPERIENCE

Many factors can influence the quality of visitor experiences in a national park. Among these are the type and range of activities and recreational opportunities that are available, ease of access to facilities and activities, the quality of information available, the type and quality of services provided, interactions with park staff and other visitors, the condition of park facilities, and the presence or absence of traffic and parking congestion.

To assist the National Park Service in complying with the Government Performance and Results Act and to determine how well visitors' needs are being met, an annual survey of visitors is conducted by the University of Idaho Cooperative Park Studies Unit. The survey was developed to measure each park's performance related to visitor satisfaction and visitor understanding and appreciation. The surveys ask visitors to rate a variety of services, recreational opportunities, and facilities related to their park experience from very poor to very good. The data are then used to summarize visitor opinions of the quality of facilities, services, and recreational opportunities. For each year in the most recent 10-year period, 1998 through 2007, the percentage of visitors to Grand Teton National Park who were satisfied overall with appropriate facilities, services, and recreational opportunities averaged more than 98% (University of Idaho Cooperative Park Studies Unit 2007).

Opportunities to experience the park's natural and cultural resources in an appropriate setting can also affect the quality of a visitor's experience. This experience includes the presence of natural and non-natural sounds. As was reported to the U.S. Congress in the *Report on the Effects of Aircraft Overflights on the National Park System* (NPS 1994), a system-wide survey of park visitors concluded that enjoying natural quiet is about as important as viewing natural scenery as a reason for visiting national parks. More than 90% of visitors to national parks indicated that both natural scenery and natural quiet were at least moderately important to their visit. The same survey indicated that system-wide in national parks, approximately 20% of visitors reported hearing or seeing aircraft during their visit, and that 2% to 3% of visitors reported impacts on their experience from those overflights.

Table 9 provides the results of a 1997 survey on the attitudes of about 850 visitor groups toward the experience of being in Grand Teton National Park. As shown in the table, 88% of visitors surveyed found "quiet" to be a moderately to extremely important feature of the park. Only 11% of park visitors rated "quiet" as not important or somewhat important (Littlejohn 1998).

TABLE 9: SURVEY RESULTS ON VISITOR ATTITUDES TOWARD FIVE PARK FEATURES

Feature	Not or Somewhat Important (percent)	Moderately Important (percent)	Very or Extremely Important (percent)	Don't Know (percent)
Native plants and animals	4	8	87	1
Scenic views	1	2	96	0
Recreational activities	22	20	57	2
Solitude	13	23	62	2
Quiet	11	23	65	1

The same survey found that most visitors (86%) did not feel that other visitors or activities interfered with their visit. Among the 14% of visitors who said that their visit was interfered with, 14 of 159 comments mentioned "noise" and 4 specifically identified "noise of motorboats" (Littlejohn 1998). Aircraft sound was not identified by any visitors in this survey. In addition, none of the visitors identified a feeling of interference because of the visibility of aircraft or the airport.

When visitors were asked, "If you were a manager planning for the future of Grand Teton National Park, what would you propose? Please be specific," 497 groups of visitors made a total of 1,035 comments. Among these, "Move airport away from park" was mentioned three times (Littlejohn 1998).

PERCEPTIONS OF DIFFERENCES IN SOUND LEVELS

The approximate threshold of human hearing is 0 A-weighted decibels (dBA) (see glossary). An increase of 10 dBA represents a perceived (to human hearing) doubling of loudness. Hence, 20 dBA would be perceived as twice as loud as 10 dBA, and normal conversation at 5 feet, which is about 60 dBA, would be perceived as 32 times as loud as 10 dBA (Ambrose and Burson 2004). Changes in sound of less than about 3 dBA are not generally noticeable outside a laboratory environment (Federal Aviation Administration 2005), although in park settings, the ambient sound levels can approach or actually be quieter than laboratories (Burson 2006).

The relationship between sound and visitor experience is not straightforward. In their article, "Soundscape Studies in National Parks," Ambrose and Burson (2004) observed that "In developed zones, there is often less sensitivity to noise, and a greater incidence of human sound that may be regarded as consistent with or necessary for park purposes. In backcountry or wilderness zones, the soundscape is expected to be natural, with little if any human caused noise."

An example of the context-sensitive nature of aircraft sound, and the ability of the same aircraft sound to produce different responses based on visitor expectations at different locations, involves the Glacier View Turnout on U.S. Highway 26/89/191, the Snake River in same area, and the historic Bar BC Ranch. These nearby facilities are generally beneath the Jackson Hole Airport flight path at a point where aircraft approaching the airport from the north are about 2,500 feet above the ground. The soundscape model estimates that during the summer (peak season), aircraft are audible about 25% of the time at all three locations, and the maximum aircraft sound (Lmax) at each site is 70 to 75 dBA. This maximum sound level is a momentary occurrence, and sound levels are lower before and after the aircraft passes the listener.

- Visitors stopped at the Glacier View Turnout may have only a general level of awareness of an aircraft's sounds because of the sounds from traffic on U.S. Highway 26/89/191, idling automobile engines, car stereos, and conversations.
- Visitors rafting on the Snake River beside the Bar BC Ranch may have a greater expectation for a natural soundscape because of the naturalness of their setting. Therefore, they may perceive the aircraft and its sound as out of context. However, the sound of the aircraft may be masked to some degree by natural sounds such as flowing water, wind, and rustling leaves, or by conversations with companions, all of which could decrease their perception of the sound or their reaction to it.
- Visitors who have walked into the Bar BC Ranch and are contemplating the scenery and the former lives of a bygone era from a quiet location may hear the aircraft for a longer period than at the other two locations, because there are fewer natural or human-caused sounds to mask the sound of the aircraft. However, the degree to which the sound intrudes on or interferes with their experience depends on their expectations, their tolerance or habituation to aircraft sound, or other factors that affect the intensity and duration of the sound.

In an examination of sound impacts on visitors using protected natural areas, Cressford (1999) acknowledges the importance of context on the effects of sound on visitors. However, he also noted wide variances in visitor reactions to the same sound levels in the same natural settings. As a result, he stated that "The differences between noticing a noise-effect and being bothered by it represent a notable degree of impact tolerance that is not consistent. Where the awareness levels are similar, the proportions of visitors actually bothered often varied considerably, suggesting case-specific degrees of noise tolerance." Fidell *et al.* (2002) reported that sound levels typically account for less than half of the variance in the prevalence of annoyance caused by environmental sound exposure. Some of the factors that have been identified as influencing whether people are annoyed by, or are merely aware of a sound, particularly in a natural or recreational setting, include the following:

- How commonly the sound occurs (Booth 1999). Sutton (1999 and 2001) found that at the two recreation sites they studied, visitor annoyance with aircraft sound increased rapidly after a threshold of 15 to 18 aircraft overflights per hour was exceeded.
- The pitch of the sound, with high-pitched sounds generally perceived as more annoying (Kariel 1990).
- Whether a sound is continuous or rhythmic, with the latter generally being perceived as more annoying (Kariel 1990). Schomer and Wagner (1996) attributed this to the three-fold increase in *noticeability* of the blade-slap of a helicopter, compared to equally loud sounds from a fixed-wing aircraft or a train, rather than annoyance with the sound level itself.
- The distance from the source, where sound produced by a source farther from a listener is often assessed as less annoying than sound of an identical loudness (to the receptor) that is produced by an identical source that is closer (Preis and Golebiewski 2004).
- The topography, with visitors to side valleys at a popular tourist destination being more sensitive to aircraft activity than are visitors to the main valleys (Sutton 2001).
- The expectations of visitors about their rights to enjoy recreational opportunities in natural areas free from perceived adverse effects of aircraft-related sound (Hunt 1999).
- Whether the sounds are perceived as interfering with a goal, such as getting away, enjoying nature, and/or relaxing (Kariel 1990).

- Whether there is a corresponding visual interference, which tends to increase the perception of annoyance (Pedersen and Wayne 2004).
- The recreationists' noise situation at home (Krog and Engdahl 2005).

Among visitors who report impacts from aircraft sound in national parks, most make a distinction between "interference" and "annoyance" (Miller 1999):

- Interference is perceived as an objective term, describing something that prevents them from doing what they want to do. It is an interruption or a distraction that typically ends when the sound source has passed.
- Annoyance is perceived as having an emotional, evaluative component. Many respondents associate a negative reaction, such as "makes me mad" or "causes my blood pressure to rise" with the term annoyance. Miller surmised that annoyance is the reaction that causes a visitor to evaluate the experience as negative or to consider registering a complaint.

Links to additional literature on social science relative to noise are available on the NPS' Natural Sounds Program website at <http://www.nature.nps.gov/naturalsounds/publications>.

In a national study of sound in NPS units that supported a noise report to Congress, 8% to 14% of the surveyed park visitors who *remembered* hearing aircraft reported that they experienced "impacts" from the aircraft sound. Visitors in the study were more likely to indicate that aircraft sound interfered with their appreciation of natural quiet and sounds of nature at the park than that they were annoyed by the sound. Compared to users of developed and other frontcountry areas, backcountry users were twice as likely to remember hearing aircraft, twice as likely to report that it interfered with their enjoyment of the park and/or the park's natural quiet, and three times as likely to feel annoyed (NPS 1994).

AIRCRAFT SOUND AND CURRENT VISITOR USE AND EXPERIENCE

Aircraft approaching and departing the Jackson Hole Airport are encouraged to avoid Grand Teton National Park as much as possible. The airport is close to the park's south boundary, and published sound abatement procedures identify a preferred approach from the south (use of Runway 01) and a preferred departure to the south (use of Runway 19). On flights from or to other directions, aircraft are requested to stay east of the Snake River and/or U.S. Highway 26/89/191 (Jackson Hole Airport Board 2006a). Despite the preference for approaches and departures that minimize flying over the park, factors that include prevailing winds, other weather conditions, and instrument flight procedures result in most approaches being made from the north and about 15% of the departures going north.

The *Master Plan, Grand Teton National Park* identified three management zones (NPS 1976). These zones were developed to help manage visitor experiences and desired conditions and are shown in Figure 8. The zones include the Mountain Zone, Valley Zone, and Through Zone, which includes corridors along the major highways through the park. These zones have different management objectives with regard to aircraft sound and are used in the impact analysis for this topic in Chapter 4.

Modeling of aircraft sound related to the use of the Jackson Hole Airport, using the Integrated Noise Model, is described in the "Natural Soundscape" section. All of the characterizations provided below are based on the July-through-September, peak season for the airport, which corresponds with the park's highest visitor use season.

The modeled sound may sometimes overstate the sound that one would actually hear at a specified location. Sounds associated with wind, moving water, road traffic, conversation, and other sources could mask the aircraft sound so that what was actually experienced by a person was less than indicated by the model. Alternately, the model may sometimes understate the sounds heard at some locations, especially in the backcountry during calm winter conditions, where the natural soundscape can be lower than the average natural ambient baseline sound levels used in the model.

Sound modeling indicated that during the 2005 peak season, aircraft use of the Jackson Hole Airport was audible in about 71% of the park. However, in most (60%) of the park, aircraft were audible for less than 5% of the time (or three minutes out of an hour). In addition, aircraft sound occurred at a level loud enough to cause speech interference (greater than 60 dBA) in 22% of the park, and about 4% of the park experienced aircraft-related sound levels that would cause speech interference for a total of more than a minute a day.

Mountain Zone

In this zone, the maximum modeled sound levels of airport-related aircraft in 2004-2005 ranged from less than 20 dBA at numerous modeled points in the northern part of the park to 58 dBA at a point directly west of the airport across the Snake River valley, about 2 miles south of White Grass Ranch. Most points in the Mountain Zone experienced maximum aircraft-related sound between 20 and 40 dBA (comparable to a recording studio and the living room of a house, respectively; see Table 7). During the July-through-September peak season, aircraft sound was audible 30% of the time (almost 20 minutes out of every hour) at the point west of the airport mentioned above. Aircraft were audible for more than 4 minutes per hour at 15 of the 220 points modeled throughout the park's Mountain Zone. At most other points, aircraft were audible for a minute or less per hour.

The Laurance S. Rockefeller Preserve primarily lies within the Mountain Zone, about 3 miles northwest of the airport. Its eastern edge straddles the boundary between the Mountain and Valley Zones, with about an eighth of the preserve in the Valley Zone (discussed below). Because of the preserve's emphasis on nature as a place of spiritual and emotional renewal, as well as management designed to prevent overcrowding and sustain the ability to experience nature in a direct and positive way, some visitors may have higher expectations of experiencing a natural soundscape while hiking in this area of the park than elsewhere in the park. The peak-season maximum sound level for the point that best represents the preserve, at 58 dBA, is higher than levels described above for most points in the Mountain Zone but is still below what might interfere with speech (levels greater than 60 dBA). Peak-season audibility of 30% was the same as for other areas in this zone.

The Mountain Zone includes 146,355 acres of recommended wilderness. The National Park Service manages this area as if it were designated wilderness under the Wilderness Act of 1964. The section titled "Impact Topics Dismissed from Further Consideration" presents the rationale for dismissing wilderness. However, the recommended wilderness as it relates to sound and visitor experience is analyzed in the Chapter 4 "Natural Soundscapes" and "Visitor Use and Experience" sections.

Valley Zone

Aircraft sound levels were considerably higher in the Valley Zone than in the Mountain Zone. Using 2004-2005 data, the modeled maximum sound levels of aircraft during the July-through-September peak season ranged from less than 40 dBA (the sound level of a typical living room without music or a television playing) at points in the northern part of the park, especially near the Mountain Zone, to 102 dBA at the point immediately north of the airport runway. The next loudest points, at 82 dBA, also are close to and in line with the runway. At most points in the Valley Zone, airport-related aircraft sound was audible for less than five minutes per hour. However, at the highest percent-time-audible points, close to the airport, visitors could hear sounds from aircraft taking off and landing for up to 24 minutes each hour. Aircraft sound occurred at a level that might cause speech interference (greater than 60 dBA) in about 10% of Valley Zone sites, but in half of this area, the time over 60 dBA totaled a minute or less per day. Speech interference could also occur at lower sound levels (at 52 dBA) during outdoor ranger programs and other Valley Zone activities where visitors are less closely spaced or attempt to communicate over longer distances.

The Gros Ventre Campground is in the Valley Zone, about 3 miles east of the airport. With 372 sites, this is the largest of the park's campgrounds and it provides a third of the park's campsites. Modeling indicates airport-related aircraft are audible in this area 38% of the time during the peak season, or about 23 minutes per hour. Campers staying at the Gros Ventre Campground could experience sound levels (maximum modeled value of 64 dBA) that may cause sleep interruption. However, sleep interruption is mitigated by the airport curfew hours of 11:30 P.M. to 6:00 A.M. and the occurrence of most airport operations between 7:00 A.M. and 10:00 P.M.

About an eighth of the Laurance S. Rockefeller Preserve, including two small sections in its eastern and southeastern parts, is in the Valley Zone. The larger of the two sections is east of the Moose-Wilson Road and contains the preserve interpretive center, road to the center, and its parking area. Modeled peak-season maximum sound level (58 dBA) is at the low end of the range for the Valley Zone but the percent-time audible of 14 to 18 minutes per hour is at the higher end.

Through Zone

The modeled maximum aircraft sound levels and percent-time audible ranges for this zone were very similar to those described for the Valley Zone. However, aircraft sound in this zone occurs against the background of other sound from highway traffic and activities in developed areas.

Moose Area

The Moose area includes lands in the Through Zone and Valley Zone. Moose, which supports large numbers of visitors participating in a wide range of indoor and outdoor activities, is about 2.5 miles north of the airport boundary, directly under the flight path. Aircraft approaching the airport from the north typically pass over Moose at about 1,000 feet above the ground. Among heavy-use areas in the park, Moose is probably the most affected by the presence of the airport because of its proximity to the airport and alignment along the runway's extended centerline.

Visitors at Moose experience maximum modeled sound levels from aircraft of 82 dBA. According to the model results, aircraft are audible at this location for about 22 minutes each hour. However, aircraft sounds in the lower part of the audibility range often are masked by other sound sources in the vicinity. Moreover, expectations for experiencing natural soundscapes or sensitivity of non-natural sounds may be different in this busy, developed area than in other, less developed areas of the park.

In the Craig Thomas Discovery and Visitor Center at Moose, aircraft sound is not sufficiently loud to cause interference with normal speech (threshold of about 60 dBA), but levels above 52 dBA (U.S. Environmental Protection Agency 1974) may affect some ranger interpretive programs. During busy periods, with the hum of equipment and numerous conversations, aircraft sound may not be perceived inside the building. Outside, the experience of having aircraft pass overhead at a height of about 1,000 feet could be considered by some visitors as inconsistent with the expectation of a national park experience. Single-sound events may cause interruption for only a few seconds, but the aggregate effect, particularly during the peak season, may be perceived negatively by visitors, even in the presence of other non-natural sounds.

Another important site in the Moose area is the Murie Ranch, a National Historic Landmark important for its association with the Murie family and the wilderness movement, including the 1964 Wilderness Act. The ranch is about a half-mile south of the Craig Thomas Discovery and Visitor Center. Aircraft sound at this location can be loud enough to interfere with conversation (maximum modeled sound is 72 dBA), but the total amount of time above 60 dBA is about a minute per 15-hour day. Some visitors may have a higher expectation of experiencing a natural soundscape at the Murie Ranch because of the historic nature of the site, as well as its geographic location in a wooded area south of Moose. Therefore, airport-related and other non-natural sounds may be perceived negatively by visitors and adversely affect their experience.

Consultation by the National Park Service with the Wyoming State Historic Preservation Office included analyzing potential airport-related sounds relative to the Murie Ranch National Historic Landmark designation. This analysis showed that aircraft audibility did not have an adverse effect on the characteristics for which the property was nominated and a “no adverse effect” determination was made by the National Park Service, with concurrence by the Wyoming State Historic Preservation Office. Additional information is included in Chapter 1 under “Impact Topics Dismissed from Further Consideration.” Correspondence relating to this determination is included in Appendix A.

Other locations in the Moose area where visitors may be sensitive to aircraft sound include Dornan’s, the Chapel of the Transfiguration, and the NPS administrative complex.

JACKSON HOLE AIRPORT AS A GATEWAY FOR VISITORS

Grand Teton National Park is in one of the more remote parts of the continental United States. While many people visit the park and surrounding area as part of an extended driving vacation, others prefer the convenience or time-savings of flying into the area. The “Socioeconomics” section in this chapter presents more detailed information on tourism in the area.

In the summer, the Jackson Hole Airport provides access to the area for visitors to Grand Teton National Park and Yellowstone National Park. In the summer of 2005, approximately 6% of visitors to Grand Teton National Park arrived by air (RRC Associates 2005). In the summer of 2008, 10% of visitor groups surveyed in Grand Teton National Park reported arriving in the area by flying on a commercial airline to the Jackson Hole Airport (Braak *et al.* 2009).

During the winter, the airport provides access to the area’s ski resorts for about 90% of winter visitors to the Jackson area (RRC Associates 2005). The Grand Targhee Resort (see Figure 1) can be accessed from either the Jackson Hole Airport or Idaho Falls Airport, but non-local visitors to Snow King Resort and Jackson Hole Mountain Resort arrive almost exclusively through the Jackson Hole Airport. Many of these people also visit the area’s national parks as part of their experience. For example, in winter, the south entrance to Yellowstone National Park from Grand Teton National Park is that park’s second most heavily used entrance, after West Yellowstone.

AIR QUALITY

Air quality was dismissed from in-depth consideration in the draft environmental impact statement, but concerns regarding this impact topic were raised in public and agency review comments. Therefore, a detailed analysis of potential impacts on air quality from the proposed action and its alternative was conducted for this final environmental impact statement.

CLEAN AIR ACT

In the Clean Air Act, Congress addressed the need to protect and enhance the quality of the nation's air resources and deal with dangers that air pollution presents to public health and welfare. Most of the nation is identified as Class II with regard to air quality protection and enhancement. However, national parks greater than 6,000 acres that existed before 1977 were automatically designated as Class I areas, which conveys the highest protection and allows very little deterioration of air quality. Grand Teton National Park is among the nation's 158 Class I air quality areas, which include national park system units, national wildlife refuge system units, and U.S. Forest Service wildernesses.

Under the Clean Air Act, the U.S. Environmental Protection Agency established federal standards for pollutants from stationary and mobile sources. Goals include preventing significant deterioration in areas where air quality meet national standards, and improving air quality in areas that do not meet standards (known as nonattainment areas).

The Wyoming Department of Environmental Quality regulates air emissions in Wyoming primarily through the state implementation plan. Federal facilities, including Grand Teton National Park, are required to comply with air quality standards to the same extent as nongovernmental entities.

Federal land managers have an affirmative responsibility to protect the air quality related values of lands in Class I areas and to consider whether any proposed major emitting facility within or outside the area would have an adverse impact on such values. As defined by the Federal Land Managers' Air Quality Related Values Workgroup (2010), an air quality related value is "A resource … that may be adversely affected by a change in air quality. The resource may include visibility or a specific scenic, cultural, physical, biological, ecological, or recreational resource identified by the [federal land manager] for a particular area." This affirmative responsibility is consistent with the NPS' mandate in the Organic Act "… to conserve the scenery … and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

National Ambient Air Quality Standards

The Clean Air Act requires the U.S. Environmental Protection Agency to set National Ambient Air Quality Standards for pollutants considered harmful to public health and the environment. The Clean Air Act established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings.

Standards have been set for six principal pollutants, called "criteria pollutants." These standards, which most recently were revised in January 2010, are shown in Table 10.

TABLE 10: NATIONAL AMBIENT AIR QUALITY STANDARDS [a]

Pollutant	Primary Standards: Level	Primary Standards: Averaging Time	Secondary Standards: Level	Secondary Standards: Averaging Time
Carbon monoxide	9 ppm (10 mg/m^3) [b]	8-hour [c]	None	
	35 ppm (40 mg/m^3)	1-hour [c]		
Lead	0.15 μg/m^3 [d]	Rolling 3-month average	Same as primary	
	1.5 μg/m^3	Quarterly average	Same as primary	
Nitrogen dioxide	53 ppb [e]	Annual (arithmetic average)	Same as primary	
	100 ppb	1-hour [f]	None	
Particulate matter (10 microns or less)	150 μg/m^3	24-hour [g]	Same as primary	
Particulate matter (2.5 microns or less)	15.0 μg/m^3	Annual (arithmetic average) [h]	Same as primary	
	35 μg/m^3	24-hour [i]		
Ozone	0.075 ppm (2008 standard)	8-hour [j]	Same as primary	
	0.08 ppm (1997 standard)	8-hour [k]		
	0.12 ppm	1-hour [l]		
Sulfur dioxide (national) [m]	*0.03 ppm (80 μg/m^3)*	*Annual (arithmetic average)*	0.5 ppm (1,300 μg/m^3)	3-hour [c]
	0.14 ppm (365 μg/m^3)	*24-hour [c]*		
	75 ppb [n]	1-hour	None	
Sulfur dioxide (State of Wyoming) [m]	60 μg/m^3	Annual (arithmetic average)		
	260 μg/m^3)	24-hour [c]		

a/ Source: U.S. Environmental Protection Agency 2010 except as noted for sulfur dioxide.
b/ m^3 = cubic meter, mg = milligram, ppb = parts per billion, ppm = parts per million, μg = microgram.
c/ Not to be exceeded more than once per year.
d/ Final rule signed October 15, 2008.
e/ The official level of the annual nitrogen dioxide standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.
f/ To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).
g/ Not to be exceeded more than once per year on average over 3 years.
h/ To attain this standard, the 3-year average of the weighted annual mean concentrations for particulate matter (2.5 microns or less) from single or multiple community-oriented monitors must not exceed 15.0 μg/m^3.
i/ To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 μg/m^3 (effective December 17, 2006).
j/ To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).
k/ (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard, and the implementation rules for that standard, will remain in place for implementation purposes as the U.S. Environmental Protection Agency undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(c) The U.S. Environmental Protection Agency is reconsidering these standards (set in March 2008).
l/ (a) The U.S. Environmental Protection Agency revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").
(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.
m/ Each state has the right to adopt the National Ambient Air Quality Standards or to publish its own standards if they are more stringent than the national standards. Wyoming primary standards for sulfur dioxide on an annual and 24-hour basis are more stringent than the national standards. Therefore, for the two values *in italics*, the state standards, from Wyoming Department of Environmental Quality 2006, are controlling.
n/ Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

Air Quality Index

As shown in the table, the National Ambient Air Quality Standards are technically complex, and some are based on long-term annual, quarterly, or rolling averages or can be evaluated only in retrospect, such as whether exceedences occurred more than once a year. Therefore, the U.S. Environmental Protection Agency developed the Air Quality Index to provide timely reporting of air pollution that could pose a risk to human health and to facilitate citizen comprehension. The Air Quality Index is reported daily, and focuses on health effects people may experience within a few hours or days after breathing polluted air (U.S. Environmental Protection Agency 2009b and 2009c).

The Air Quality Index includes five of the six criteria pollutants addressed by the National Ambient Air Quality Standards. These include carbon monoxide, nitrogen dioxide, ground-level ozone, particulate matter, and sulfur dioxide. Lead is not included because controls that included a 1996 ban on the use of lead in automobile gasoline reduced average nationwide lead concentrations in outdoor air by 91% in 2008 compared to 1980 values (U.S. Environmental Protection Agency 2010a). This decrease occurred despite the continued use of lead as an octane booster in fuel for piston-engine aircraft at airports around the nation, including the Jackson Hole Airport. Lead emissions usually do not pose a human health risk except near airports and industrial sources such as metals processers, waste incinerators; and manufacturers of glass and cement (U.S. Environmental Protection Agency 2008a).

The Air Quality Index scale runs from 0 to 500. A value of 100 generally corresponds to the National Ambient Air Quality Standard for the pollutant, which was set to protect the health of sensitive populations. Higher index values indicate greater levels of air pollution and health concern. Specifically:

- "Good" is an index value of 0 to 50. Air quality is satisfactory and air pollution poses little or no risk.
- "Moderate" is an index value of 51 to 100. Air quality is acceptable, but one or more pollutants could pose a moderate health concern for a very small number of people.
- "Unhealthy for Sensitive Group" is an index value of 101 to 150. Although the general public is not likely to be affected, people with lung disease, older adults, and children may experience adverse health effects.
- "Unhealthy" is an index value of 151 to 200. Everyone may begin to experience some adverse health effects, and members of sensitive groups may experience more serious effects.
- "Very Unhealthy" is an index value of 201 to 300. This would trigger a health alert signifying that everyone may experience more serious health effects.
- "Hazardous" is an index value greater than 300. This would trigger health warnings of emergency conditions. The entire population is more likely to be affected (U.S. Environmental Protection Agency 2009b and 2009c).

Air quality monitoring values are converted into separate index values for each of the five pollutants. The highest index value among the five is reported as the index value for that day. For example, if a community's Air Quality Index is 130 for ozone and 101 for particulate matter, the Air Quality Index value for that day would be announced as 130 for ozone (U.S. Environmental Protection Agency 2009b).

The scale for each pollutant is not linear. Thus, an index value of 100 does not indicate twice the pollution of a value of 50, nor does it mean twice as harmful. Pollutant concentrations that correspond to each Air Quality Index category are provided in *Technical Assistance Document for the Reporting of Daily Air Quality – the Air Quality Index* (Mintz 2009).

Air Quality at Grand Teton National Park Relative to National Ambient Air Quality Standards and the Air Quality Index

Baseline concentrations for five of the six criteria pollutants were derived from the closest existing Wyoming Department of Environmental Quality air quality monitoring stations to Grand Teton National Park. Table 11 presents the averaging period, monitoring locations, and maximum measured concentrations from 2006 through 2008. The highest value for each pollutant from these three years is shown in the last column and was used for air quality modeling in the Chapter 4 analysis to represent reasonable worst-case conditions.

TABLE 11: SUMMARY OF BACKGROUND AIR QUALITY VALUES FOR THE REGION OF GRAND TETON NATIONAL PARK, 2006 THROUGH 2008

Pollutant	Averaging Period	Monitoring Location [a/]	Maximum Measured Concentration			Concentration Selected for Background
			2006	2007	2008	
Sulfur dioxide	3-hour	South Pass	No data [b/]	14.9 μg/m^3 [c/]	**16.5 μg/m^3**	16.5 μg/m^3 [d/]
	24-hour	South Pass	No data	5.5 μg/m^3	**8.4 μg/m^3**	8.4 μg/m^3
	Annual average	South Pass	No data	**2.6 μg/m^3**	**2.6 μg/m^3**	2.6 μg/m^3
Particulate matter (10 microns or less)	24-hour	Jackson	80 μg/m^3 [c/]	35 μg/m^3	**93 μg/m^3**	93 μg/m^3
	Annual average	Jackson	**21 μg/m^3**	17 μg/m^3	19 μg/m^3	21 μg/m^3
Particulate matter (2.5 microns or less)	24-hour	Jackson	**23.3 μg/m^3**	17.9 μg/m^3	13.7 μg/m^3	23.3 μg/m^3
	Annual average	Jackson	**6.84 μg/m^3**	5.55 μg/m^3	5.22 μg/m^3	6.84 μg/m^3
Nitrogen dioxide	Annual average	Daniel South	**5.64 μg/m^3**	**5.64 μg/m^3**	**5.64 μg/m^3**	5.64 μg/m^3
Ozone	8-hour (4th high)	Daniel South	**0.074 ppm**	0.066 ppm	**0.074 ppm**	0.074 ppm
Carbon monoxide	1-hour	Murphy Ridge	No data	**1,832 μg/m^3**	1,031 μg/m^3	1,832 μg/m^3
	8-hour	Murphy Ridge	No data	**1,718 μg/m^3**	802 μg/m^3	1,718 μg/m^3
Lead	Quarterly average	Shoshone County, Idaho	No data	No data	No data	0.04 μg/m^3

a/ Except for lead, monitoring locations were specified by the Wyoming Department of Environmental Quality, Air Quality Division and are operated by this agency.
b/ Monitoring for this pollutant at this site did not begin until 2007.
c/ μg/m^3 = micrograms per cubic meter. ppm = parts per million.
d/ Highest values are denoted with bold and were used as the background concentration in air quality modeling in Chapter 4.

As discussed above under "Air Quality Index," concentrations of lead in outside air and the associated health concerns have decreased since lead was banned from automobile gasoline in 1996. As a result, lead is not monitored at the sites shown in Table 11. Therefore, the National Park Service approved the use of background concentrations of lead that are based on the best available data, which consist of quarterly averages from the Kellogg monitor in Shoshone County, Idaho, about 500 miles northwest of Grand Teton National Park. The most recent values, from 2000, 2001, and 2002, respectively, were 0.04, 0.03, and 0.03 micrograms of lead per cubic meter of air. As shown in Table 11, the concentration selected for background was 0.04 micrograms of lead per cubic meter of air.

Sources of air pollution associated with the Jackson Hole Airport include the following:

- Eight boilers that burn No. 2 oil;
- Five stand-by electrical generators powered by diesel fuel;
- Aircraft engines that emit pollutants during idling, taxiing, and landing and takeoff sequences;
- Auxiliary power units for aircraft;
- Ground-support equipment; and
- Vehicular traffic associated with travel in and out of the airport and parking.

According to current data on the U.S. Environmental Protection Agency's AirData interactive web site at <http://epa.gov/air/data/geosel.html>, Teton County, Wyoming, including Grand Teton National Park, is an attainment area for all six criteria pollutants.

The U.S. Environmental Protection Agency calculates an Air Quality Index value for Teton County daily, based on readings from air quality monitors. There are no monitors in Grand Teton National Park, but one or more of the five criteria pollutants in the Air Quality Index are sampled regionally by monitors at sites in Jackson, Yellowstone National Park, Daniel, and Pinedale. A summary of Air Quality Index values for Teton County from 2003 through 2007 is presented in Table 12. As shown in the table:

- In the five-year period, only one day had an index value above "moderate." That value was based on an ozone reading of 116, which was considered "Unhealthy for Sensitive Groups." Because the Air Quality Index upper threshold for "moderate" generally matches the National Ambient Air Quality Standards, this indicates that exceedences of the standards are very rare.
- Air quality in the Grand Teton National Park vicinity consistently is "good," with 85% to 98% of days each year falling into this category.
- On at least 94% of days each year, ozone was the pollutant with the highest index value that, therefore, determined the consolidated index value. Nitrogen dioxide and sulfur dioxide never had the index-determining high value, and carbon monoxide represented this value on 1% or fewer of days. Particulate matter usually represented the highest value that determined the index on about 4% of days annually.

The effects of operations at the Jackson Hole Airport on air quality at Grand Teton National Park relative to the National Ambient Air Quality Standards and the Air Quality Index were modeled using the data from actual aircraft operations from October 2004 through September 2005 that were presented in Table 8. Descriptions of the modeling procedures are provided in Chapter 4 and Appendix H. Based on model results, criteria pollutants are currently being generated by activities associated with the Jackson Hole Airport at the following rates:

- Sulfur dioxide: 23.3 tons per year;
- Particulate matter: 3.7 tons per year;
- Nitrogen oxides: 137.3 tons per year;

TABLE 12: AIR QUALITY INDEX SUMMARY FOR TETON COUNTY, WYOMING, 2003 THROUGH 2007 [a/]

Parameter	2003	2004	2005	2006	2007
Days of data	356	365	365	365	365
Maximum Air Quality Index value	87	84	94	116	80
Days rated "good"	324 (91%)	356 (98%)	350 (96%)	309 (85%)	344 (94%)
Days rated "moderate"	32 (9%)	9 (2%)	15 (4%)	55 (15%)	21 (6%)
Days above "moderate"	0	0	0	1 (<1%)	0
Determining pollutant: days (%)					
Carbon monoxide	1 (<1%)	4 (1%)	0	0	4 (1%)
Nitrogen dioxide	0	0	0	0	0
Particulate matter	13 (4%)	16 (4%)	16 (4%)	16 (4%)	5 (1%)
Ground-level ozone	342 (96%)	344 (94%)	349 (96%)	349 (96%)	356 (98%)
Sulfur dioxide	0	0	0	0	0

a/ Source: Information extracted from the Internet at <http://epa.gov/air/data/monaqi.html?st~WY~Wyoming>.

- Carbon monoxide: 549.8 tons per year; and
- Lead: 0.05 tons per year.

There is no value for ozone, which is not emitted directly but is formed in the atmosphere from nitrogen oxides and volatile organic compounds in the presence of sunshine.

Baseline Air Quality Index from Modeling

To establish a modeled existing conditions baseline, the Air Quality Index was calculated using modeled emissions results from Jackson Hole Airport operations from October 2004 through September 2005. An Air Quality Index value is only calculated for pollutants with 8-hour or 24-hour averaging periods. All calculated Air Quality Index values represent the sum of the highest modeled value for that averaging period at the airport boundary plus the background values shown in Table 10, and were calculated using the procedures in Mintz (2009). The modeled existing conditions baseline Air Quality Index values for criteria pollutants were as follows:

- Sulfur dioxide: 29 (good);
- Particulate matter with a diameter of 10 microns or less: 75 (moderate);
- Particulate matter with a diameter of 2.5 microns or less: 98 (moderate); and
- Carbon monoxide: 30 (good).

In other words, even on the worst air quality day in the five-year period from 2004 through 2008, there would not be health-related concerns for members of sensitive groups breathing the air at the airport boundary line, based on the combined effects of airport emissions and background concentrations of criteria pollutants.

Lead Emissions from the Use of Leaded Gasoline in Piston-Engine Aircraft

The use of lead as an additive in automotive gasoline in the United States was banned in 1996. This action, coupled with controls on waste incineration and other stationary sources, resulted in a nearly

91% decrease nationwide in lead concentrations in outdoor air by 2008, compared to 1980 values (U.S. Environmental Protection Agency 2010a).

Lead continues to be used in fuel for piston-engine aircraft at airports around the nation, including the Jackson Hole Airport. Therefore, in its written comments on the draft environmental impact statement, the U.S. Environmental Protection Agency recommended that “the lead emissions and the potential impacts to the Park and nearby residents be discussed in view of current and projected future general aviation activities at the airport.”

Lead is added to the fuel used in piston-engine aircraft in the form of tetraethyl lead. This lead additive contributes to safety by boosting fuel octane and helping to prevent valve seat recession and the resulting loss of compression for engines without hardened valves. Lead is not added to the jet fuel that is used in commercial aircraft, military aircraft, or other turbine-engine-powered aircraft. Emissions of lead from piston-engine aircraft using leaded fuel represent about half of the national inventory of lead emitted to air and are the largest remaining source category of lead emissions (U.S. Environmental Protection Agency 2010a).

Because of the persistence of lead, emissions of this metal contribute to environmental concentrations for many years. By far, most of the air-related lead in natural ecosystems, including those in Grand Teton National Park, was deposited in the past when lead was widely used in gasoline (U.S. Environmental Protection Agency 2010a).

There is concern about the fuel used in piston-engine aircraft as an ongoing source of lead in the environment. Therefore, on April 28, 2010, the U.S. Environmental Protection Agency issued an advanced notice of proposed rulemaking to evaluate the potential for public health and welfare impacts and to consider emission standards for lead from piston-engine aircraft. The proposal is in the study phase, and any action would have to be implemented cooperatively with the Federal Aviation Administration. Moreover, any resulting regulations may not affect the in-use fleet, so it could be many years before the retirement of existing aircraft and their replacement with reduced-lead models would make a substantial difference in the amount of lead annually deposited from operations at the nation’s airports (U.S. Environmental Protection Agency 2010a).

The U.S. Environmental Protection Agency calculated lead emissions at each of 3,414 airport facilities in the United States, based on 2002 consumption of leaded fuel by piston aircraft nationwide. The estimates were determined from each airport’s percentage of the nation’s piston-engine aircraft landing and takeoff activity, with corrections for factors such as proportions of single- and twin-engine aircraft at each airport and the retention of lead in the engine and oil. Based on these calculations, the use of leaded gasoline in aircraft using the Jackson Hole Airport was estimated to result in emissions of about 76 kilograms (168 pounds) of lead per year (U.S. Environmental Protection Agency 2008b).

Lead emissions resulting from piston aircraft using the Jackson Hole Airport were modeled using the data from actual aircraft operations from October 2004 through September 2005 that were presented in Table 8. Descriptions of the modeling procedures are provided in Chapter 4 and Appendix H. As described above, based on model results, lead is being generated by activities associated with the Jackson Hole Airport at a concentration of 0.008 micrograms per cubic meter. This equates to an annual rate of 0.05 tons, or about 45 kilograms (100 pounds) per year. While this is only about 60 percent of the value reported in the U.S. Environmental Protection Agency (2008), it is remarkably close considering the simple techniques employed in that study.

Increment Analysis: Significant Impact Level and Significant Impact Area

The proposal to extend the 1983 agreement for the Jackson Hole Airport is not subject to review under Clean Air Act regulations for Prevention of Significant Deterioration permitting because no construction of new or modified emission sources, and no significant increases in existing emission levels, are planned. However, in its comments on the draft environmental impact statement, the U.S. Environmental Protection Agency cited the Jackson Hole Airport's unique location within a federal Class I protection area, along with references to provisions in the Clean Air Act prescribing special considerations and programs to protect air quality and air quality related values. Because of these circumstances, this agency requested that a Prevention of Significant Deterioration - type increment assessment be performed.

Increment is the amount of additional pollutant that all sources collectively may emit beyond an established baseline pollutant level. Additional pollutants in excess of the increment would cause a significant deterioration in air quality. Increment is consumed when new emissions contribute to an increase in ambient concentrations above the baseline, and expanded when the emissions from an existing source are reduced.

The "significant impact level" is a *de minimis* threshold applied to individual facilities that submit a permit application to emit a regulated pollutant in an area that is in attainment with the National Ambient Air Quality Standards (such as the area around Grand Teton National Park). If emissions from a facility are below the significant impact levels, it is assumed that the facility would not consume any of the available increment. Table 13 shows the controlling significant impact levels that are applicable to this analysis of emissions generated within Grand Teton National Park, which is a Class I area. Because Class I standards were not provided for particulate matter, the Class II standards are controlling for this analysis.

TABLE 13: SIGNIFICANT IMPACT LEVELS AND SIGNIFICANT IMPACT AREA RADII RESULTING FROM MODELING OF JACKSON HOLE AIRPORT OPERATIONS OCCURRING FROM OCTOBER 2004 THROUGH SEPTEMBER 2005

Pollutant and Averaging Period	Significant Impact Level (micrograms per cubic meter) [a/]	Area Type	Significant Impact Area Radius in kilometers (miles)
Sulfur dioxide 3-hour	1	Class I	>14 (8.7)
Sulfur dioxide 24-hour	0.2	Class I	>14 (8.7)
Sulfur dioxide annual	0.1	Class I	4.6 (2.9)
Particulate matter with diameters of 10 microns or less, 24-hour	0.3	Class I	8.1 (5.0)
Particulate matter with diameters of 10 microns or less, annual	0.2	Class I	0.9 (0.6)
Carbon monoxide 1-hour	2,000	Class II	7.7 (4.8)
Carbon monoxide 8-hour	500	Class II	9.5 (5.9)
Nitrogen dioxide annual	0.1	Class I	10.7 (6.6)

a/ Class I significant impact levels were provided by Andrea Stacy of the NPS' Air Resources Division in a September 21, 2009 email. The Class II significant impact levels are from Wyoming Department of Environmental Quality 2006.

A Prevention of Significant Deterioration increment assessment involves calculating the effect on the increment by considering existing emissions from other sources permitted after the baseline date in the vicinity whose pollution may extend into the vicinity of the new facility. That vicinity, known as the "significant impact area," is defined as the maximum radial distance in any direction from the source within which predicted concentrations of air pollutants are above the significant impact levels shown in Table 13 for each pollutant and averaging period.

Significant impact areas for each of the criteria pollutants and averaging periods shown in Table 13 were modeled to establish the existing conditions baseline using the actual aircraft operations from October 2004 through September 2005 that are in Table 8, and actual weather conditions for the period from 2004 through 2008. Descriptions of the modeling procedures are provided in Chapter 4 and Appendix H. Maps of the results for the modeled existing conditions baseline are included in Appendix H. As shown in those maps and indicated in Table 13:

- The significant impact area radii for sulfur dioxide using 3-hour and 24-hour averaging periods extended beyond the modeled area toward the north. However, in all other directions, the extent of the significant impact area was within the modeled area, which generally was about 12 to 14 kilometers (7.5 to 8.7 miles) from the airport source area. Because the undeveloped Grand Teton National Park lies to the north in the same direction as the farthest downwind distance of pollutant transport, sulfur dioxide concentrations would decrease to below the significant impact level shown in Table 13 before encountering emissions from any other increment-consuming sources. Therefore, there would be no additive effect from other sources and the increment assessment can be based only on airport emissions.
- For all of the other pollutants and averaging periods, the significant impact area fell entirely within the modeled area. The significant impact area radii from the airport source ranged from 0.9 kilometers (about a half mile) for particulate matter over the annual averaging period, to 10.7 kilometers (6.6 miles) for nitrogen dioxide over the annual averaging period. For all of these pollutants, there also would be no additive effect from other sources and the increment assessment can be based only on airport emissions.

VISIBILITY

Visibility refers to the clarity with which scenic vistas and landscape features are perceived at long distances. Vistas, including those in national parks, can be obscured by haze, most of which is caused by air pollution particles. When light strikes the particles, some light is absorbed and some is scattered before it reaches an observer. Together, these effects reduce the view's clarity and color.

Without the effects of human-made air pollution, a natural visual range would be about 140 miles in western areas of the United States. Because of humidity (water particles), the natural visual range in the eastern half of the nation would be about 90 miles (U.S. Environmental Protection Agency 2001).

Protecting Visibility in Class I Areas

The Clean Air Act includes multiple provisions to protect and enhance visibility in Class I areas, which include Grand Teton National Park. Specifically:

- Section 103 requirements for a national network to monitor, collect, and compile air quality data specifically include visibility. Under the same section, biennial reporting to Congress must include effects on visibility.
- State implementation plans defined in section 110 must address visibility protection.

- Visibility is the only air quality related value specifically identified in section 165, which defines the affirmative responsibility of federal land managers to protect such values in Class I areas.
- A national visibility goal is established in section 169A and includes "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from manmade air pollution." Section 169B requires the U.S. Environmental Protection Agency, in conjunction with the National Park Service and others, to provide Congress with regular assessments of the actual progress and improvements in visibility in the Class I areas.

Visibility monitoring occurs under the Interagency Monitoring of Protected Visual Environments (IMPROVE) program. IMPROVE sites were established to be representative of all mandatory Class I areas except the isolated Bering Sea Wilderness (U.S. Environmental Protection Agency 2001). Grand Teton National Park does not host an IMPROVE monitoring site. Instead, visibility in this park is determined based on data from monitoring stations near Pinedale and the Bridger Wilderness (about 80 miles southeast of the Jackson Hole Airport) and in Yellowstone National Park at the Lake maintenance facility (about 90 miles north of the Jackson Hole Airport).

Five major types of small particles (aerosols) are measured by the IMPROVE program. These particles and their major human-caused sources include the following.

- Sulfate aerosols are generally formed in the atmosphere from sulfur dioxide. Coal combustion is the major human-made source of sulfur dioxide.
- Nitrate aerosols are formed in the atmosphere from the nitrogen oxides that result from the combustion of fossil fuels, including coal, natural gas, gasoline, diesel fuel, and aviation fuel.
- Organic carbon aerosols originate as emissions from vegetative growth, vegetation burning, or solvent use.
- Elemental carbon particles are often introduced into the atmosphere by incomplete combustion.
- Crustal material results from disturbances to the soil, such as wind erosion, agricultural tilling, heavy construction, and travel on unpaved roads (U.S. Environmental Protection Agency 2001).

The contributions of each of these particles to the loss of visibility at the IMPROVE samplers near Grand Teton National Park are presented in Table 14.

TABLE 14: CONTRIBUTION OF PARTICLE TYPES TO REDUCTIONS IN VISIBILITY IN THE VICINITY OF GRAND TETON NATIONAL PARK [a/]

Particle Type	Pinedale near Bridger Wilderness (percent)	Yellowstone National Park (percent)
Sulfates	37	29
Nitrates	7	7
Organic carbon	29	36
Elemental carbon	9	9
Crustal material	18	19

a/ Source: U.S. Environmental Protection Agency 2001.

The particles that reduce visibility at Grand Teton National Park can be produced locally, such as wind-blown dust from bare fields or dirt roads, or can originate from distant sources. For example, sulfate emissions from the Los Angeles area in southwest California have a reasonably high probability of affecting air quality in Grand Teton National Park. Some of the other distant sources that might be contributing visibility-reducing sulfate particles to the Grand Teton National Park area include the coal-fired Navajo Generating Station near the Arizona-Utah line and industrial sources around Salt Lake City, Utah (Malm 1999).

The U.S. Environmental Protection Agency's Regional Haze Rule requires states to establish goals that will result in improved visibility in Class I areas that include Grand Teton National Park by reducing pollutant emissions. The Regional Haze Rule calls for visibility improvements on the 20% of days each year with the most-impaired visibility ("20% worst days"), with no additional visibility loss on the 20% of days each year with the least-impaired visibility ("20% best days") (U.S. Environmental Protection Agency 2001).

At the Yellowstone National Park IMPROVE monitor:

- Between 1994 and 1998, there was a statistically significant trend toward improved visibility on the 20% best days. No statistically significant change in visibility was found for mid-range or 20% worst days.
- The trend between 1998 and 2007 included no change on the 20% worst days and "possible decreasing haze" on the 20% best days.

At the Pinedale IMPROVE monitor near the Bridger Wilderness:

- Between 1994 and 1998, there were no statistically significant changes in visibility for any categories.
- Between 1998 and 2007, there was no change on the 20% worst days and "decreasing haze" on the 20% best days (U.S. Environmental Protection Agency 2001 and 2010d).

Based on these trends, visibility at Grand Teton National Park over the past 15 years has generally been stable, with improvements in the clarity of views on the best days.

Visibility Analysis for Jackson Hole Airport Emissions

To protect visibility, proposed new sources of air pollution must be modeled to determine their effects in Class I areas, including those hundreds of miles distant. Usually, the VISCREEN model is adequate, unless the results indicate the need for more sophisticated analyses. Emissions from a facility have the potential to be perceptible to untrained observers under "reasonable worst case" conditions if either of two technical screening factors is exceeded:

- The "delta E" value, which indicates the perceptibility of emissions based on color differences and brightness, is greater than 2.0; or
- The "contrast" value, which is a spectral criterion defined for a green wavelength of 0.55 microns, is greater than 0.05 (U.S. Environmental Protection Agency 1992).

If modeling for a proposed new source, such as a planned industrial plant less than 50 kilometers (30 miles) from Grand Teton National Park, showed that either condition was likely to occur in Grand Teton National Park or other Class I area, the emissions system of that source would have to be redesigned until modeling demonstrated that neither criterion would be exceeded.

The action to extend the agreement for the Jackson Hole Airport is not subject to review under Clean Air Act regulations for protection of visibility under the Prevention of Significant Deterioration program because no construction of new or modified emission sources, and no significant increases in existing emission levels, are planned. However, in its comments on the draft environmental impact statement, the U.S. Environmental Protection Agency cited the Jackson Hole Airport's unique location within a federal Class I protection area, along with references to provisions in the Clean Air Act prescribing special considerations and programs to protect air quality and air quality related values. Because of these circumstances, this agency requested that a visibility analysis be performed, similar to the analysis that would be applied to a new source.

The effects of operations at the Jackson Hole Airport on visibility in Grand Teton National Park were modeled in VISCREEN using the data from actual aircraft operations from October 2004 through September 2005 that were presented in Table 8, and actual meteorological conditions from the years 2004 through 2008. Descriptions of the modeling procedures are provided in Chapter 4 and Appendix H.

The level 2 VISCREEN analysis using realistic meteorological conditions of F-class stability and wind speed of 2.0 meters per second, and a modified virtual point source distance of 19 kilometers (12 miles), produced the following results:

- Delta E for sky: 1.618;
- Delta E for terrain: 0.574;
- Contrast for sky: -0.011; and
- Contrast for terrain: 0.0.005.

All of these values are below the technical screening criteria presented above. Based on these values, modeling indicates that emissions resulting from existing activities at the Jackson Hole Airport are not causing changes in visibility in Grand Teton National Park that would be perceptible to untrained observers under "reasonable worst case" conditions. This finding indicates that under the modeled existing conditions baseline, airport emissions are not affecting visibility in the Class I area.

DEPOSITION OF NITROGEN AND SULFUR

The affirmative responsibility of federal land managers to protect the air quality related values of Class I areas includes minimizing the deposition of air pollutants onto land and water. Nitrogen and sulfur move from the atmosphere to soil and water systems as wet deposition in rain, snow, and fog, and as dry deposition. Dry deposition can account for 20% to 80% of total acid deposition, depending on location and climate (U.S. Environmental Protection Agency 2010d).

When nitrogen and sulfur enter terrestrial and aquatic systems, documented effects include:

- Acidification of lakes, streams, and soils;
- Leaching of nutrients from soils;
- Injury to high-elevation spruce forests;
- Changes in terrestrial and aquatic species composition and abundance;
- Changes in nutrient cycling;
- Unnatural fertilization of terrestrial ecosystems; and

- Eutrophication of lake systems (Federal Land Managers' Air Quality Related Values Workgroup 2010).

Deposition of nitrogen and sulfur from air pollution can fluctuation based on meteorological conditions. Therefore, biennial reporting to Congress employs 3-year average data to help ensure that trends reflect actual changes (U.S. Environmental Protection Agency 2010d). This convention was largely followed in the following discussion.

Historic Deposition Rates for Nitrogen and Sulfur

Some deposition of nitrogen and sulfur occurs from natural sources, such as forest fires and volcanic activity. Estimated background levels are about 0.25 kilograms per hectare per year *each* for nitrogen and sulfur in western parts of the United States, including the Grand Teton National Park area. Background levels in eastern states probably are about twice the western values (National Park Service and U.S. Fish and Wildlife Service 2002).

Human activities, primarily involving the combustion of fossil fuels, have substantially increased atmospheric concentrations of nitrogen and sulfur. The period of 1989-1991 is used as a baseline for determining trends in managing nitrogen and sulfur deposition because it immediately predates controls on nitrogen and sulfur emissions mandated by the Clean Air Act Amendments in 1990. During this period, the two deposition monitors in the Rocky Mountain region (in Montana and Utah) showed:

- Average total nitrogen wet deposition of 1.6 and 2.5 kilograms per hectare per year; and
- Average total sulfur wet deposition of 1.3 kilograms per hectare per year (both monitors).

In the same period, many monitors in the east and midwest parts of the country had average total nitrogen deposition rates above 9 kilograms per hectare per year and average total sulfur deposition rates above 15 kilograms per hectare per year (U.S. Environmental Protection Agency 2010d).

Current Deposition Rates for Nitrogen and Sulfur

In the eastern United States, total nitrogen deposition decreased by 25% between 1989-1991 and 2005-2007 and total sulfur deposition decreased by 44%. Similar comparisons cannot be made for Rocky Mountain areas, where two deposition monitors operated in 1989-1991, only one of which (Montana) was still in service in 2005-2007. However, trends in pollutant concentrations in precipitation in Yellowstone National Park between 1990 and 1999 showed "improvement" for nitrate and "significant improvement" for sulfate (NPS 2002c). Data from the nearly 20 monitors now operating in western states indicate that Clean Air Act requirements to limit emissions continue to reduce nitrogen and sulfur deposition in this region (U.S. Environmental Protection Agency 2010d).

The 2005-2007 nitrogen and sulfur deposition values from the stations closest to Grand Teton National Park include:

- Average total deposition at the Pinedale monitor near the Bridger Wilderness (about 65 miles from Grand Teton National Park) of nitrogen and sulfur, respectively, at 1.4 and 0.6 kilograms per hectare per year; and
- Average total deposition at the Yellowstone National Park (about 60 miles from Grand Teton National Park) monitor of nitrogen and sulfur, respectively, at 1.4 and 0.7 kilograms per hectare per year (U.S. Environmental Protection Agency 2010d).

In the Rocky Mountains, nearby sites can have different rates of deposition because of differences in elevation, slope, aspect, and precipitation (Nanus *et al*. 2003). As a result, there may be substantial differences between deposition of nitrogen and sulfur occurring at the lower-elevation sites of these monitors and high-altitude lakes. In addition, there are year-to year-fluctuations in deposition rates at the Pinedale and Yellowstone sites, as noted in the 2010 biennial report to Congress (U.S. Environmental Protection Agency 2010 *Our Nation's Air*). During the 2005-2007 period:

- Differences in inorganic nitrogen wet deposition from combined nitrate and ammonium varied by about 30% among years at the Yellowstone site and 70% among years at the Pinedale site.
- Annual values for wet deposition of sulfate ion (a larger molecule than the elemental sulfur reported in the preceding set of bullets) varied by 100%, from lows of 1 kilogram per hectare to highs of 2 kilograms per hectare, at both stations (National Atmospheric Deposition Program 2009).

No data have been collected at high-elevation lakes in Grand Teton National Park to measure current nitrogen and sulfur deposition rates. Therefore, a protocol was developed for this environmental impact statement by Stacy and Blett (2010, unpublished paper) to estimate current deposition values at Grand Teton National Park. This method involved:

- Interpolating wet nitrogen concentration data from the closest National Atmospheric Deposition Program monitors, at Yellowstone National Park and Pinedale, Wyoming, multiplied by precipitation over elevational gradients from the U.S. Geological Survey's Parameter-elevation Regressions on Independent Slopes (PRISM) model to estimate annual wet deposition at high-elevation sites in Grand Teton National Park; and
- Converting wet deposition to total deposition at Grand Teton National Park using the dry-to-wet deposition ratio from the co-located National Atmospheric Deposition Program and Clean Air Status Trends Network monitors in Yellowstone National Park.

Using this method, Stacy and Blett (2010, unpublished paper) estimated deposition rates at high-elevation lakes in Grand Teton National Park as follows:

- Total nitrogen deposition at high-elevation sites is about 5.8 kilograms per hectare per year.
- Total sulfur deposition in high-elevation areas is about 3.2 kilograms per hectare per year.

Deposition Analysis Thresholds

Deposition analysis thresholds for nitrogen and sulfur were developed jointly by the National Park Service and U.S. Fish and Wildlife Service (2002) and reaffirmed by the Federal Land Managers' Air Quality Related Values Workgroup (2010). A deposition analysis threshold is "the additional amount of nitrogen and sulfur deposition within a Class I area, below which estimated impacts from a proposed new or modified source are considered insignificant." The thresholds include total (both wet and dry) deposition in all inorganic forms of these elements (for example, nitrogen oxides, nitric acid, ammonium ion, and ammonia forms of nitrogen).

The calculation of a deposition analysis threshold for the eastern and western United States was based on the deposition of nitrogen and sulfur that was occurring from natural sources before human activities, the year-to-year variability described at the beginning of this deposition discussion, and concerns about the cumulative effects of deposition over multiple years. The deposition analysis threshold that is used by the National Park Service and U.S. Fish and Wildlife Service was employed for this environmental impact statement. This threshold is 0.005 kilograms per hectare per year *each* for nitrogen and sulfur in the western United States, including Grand Teton National Park. The threshold in eastern states is twice the western value.

Critical Load Values

Critical loads as they relate to air resource management in Class I areas are defined as "the quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge" (Federal Land Managers' Air Quality Related Values Workgroup 2010). Above the critical load, changes to the most sensitive ecosystem components would start occurring.

Canada uses the term "critical load" in its *Canada-Wide Acid Rain Strategy for Post-20*. However, it defines the critical load for aquatic ecosystems as the amount of wet sulfate deposition (with no consideration of nitrogen component) that protects 95% of lakes from acidifying to a pH level of less than 6. For upland areas, it considers effects of deposition-related acidity (but not nutrients) on forest soil, reported in units of acid equivalents per hectare per year (Environment Canada 2010). These thresholds are more permissive than the thresholds that result from the workgroup definition in the preceding paragraph and do not include nitrogen, a key pollutant in this analysis. Therefore, the Canadian critical load values were not used in this determination of effects from deposition of nitrogen and sulfur in Grand Teton National Park.

Ecosystem-level critical loads from deposition are challenging to determine, in part because the major increases in atmospheric deposition that began in the middle of the past century have already produced ecosystem changes. Moreover, it is difficult to determine if, for example, algal species diversity changes in an alpine lake resulted from increased nutrient nitrogen and/or acidity from atmospheric deposition, warmer temperatures from carbon dioxide-related climate change, or a grazing zooplankton species that was inadvertently introduced when the lake was stocked with trout. Also, reporting in the literature is inconsistent with regard to, for example, wet versus total (wet plus dry) deposition, seasonality (snowpack, precipitation, or year-round), reporting units (hectares per year in kilograms versus charge-equivalent units), and chemical species (such as elemental nitrogen, nitrogen as nitrate and/or nitrite, and with or without ammonia nitrogen).

Despite these challenges, researchers are using multiple approaches to determine deposition critical loads for sensitive Rocky Mountain ecosystems. Findings regarding deposition rates that result in critical loads in this region include the following.

- Williams and Tonnessen (2000) identified a critical load related to surface-water acidification for the Colorado Front Range mountains for nitrogen of 4.0 kilograms per hectare per year based on alpine lake chemical responses to snowmelt.
- Baron (2006) found in a statistical review of historical data that a wet deposition rate for nitrogen of 1.5 kilograms per hectare per year corresponded to the reported time of alteration of diatom assemblages attributed to nitrogen deposition in alpine lakes in Rocky Mountain National Park in Colorado.
- Saros *et al.* (2010) determined a critical load of 1.4 kilograms per hectare per year wet deposition of nitrogen significantly changed diatom communities in both the eastern Sierra Nevada and the greater Yellowstone ecosystem (that is, Yellowstone National Park).
- Bowman *et al.* (2006) added nitrogen to a species-rich alpine dry meadow on Niwot Ridge in the Colorado Front Range mountains. Based on the results, they concluded that current deposition at the study site of about 6 kilograms per hectare per year is already affecting the vegetation (that

is, is above the critical load). They estimated that changes in individual species abundance occur at a total nitrogen deposition rate of about 4 kilograms per hectare per year and community change occurs at a total nitrogen deposition rate of about 10 kilograms per hectare per year.

- The U.S. Forest Service has been studying the use of lichen species diversity and composition to assess air pollution in the Cascade Range in western Oregon and Washington. They found adverse effects to diversity and composition when annual wet deposition of nitrogen and sulfur exceeded 2.0 and 2.4 kilograms per hectare per year, respectively (U.S. Forest Service 2010).

No data have been collected at Grand Teton National Park to determine actual deposition critical loads for the park's high-elevation lakes. However, results from the studies cited above may be applicable. Therefore, in consultation with the NPS Air Resources Division, the nitrogen deposition critical load value for Grand Teton National Park for high-elevation lakes was identified as 1.5 kilograms per hectare per year and 4.0 for alpine vegetation communities. Deposition rates estimated for Grand Teton National Park by Stacy and Blett (2010, unpublished paper) were 5.8 kilograms per hectare per year for nitrogen and 3.2 kilograms per hectare per year for sulfur. Based on these estimates, current nitrogen deposition rates in the park are above the critical value threshold of 1.5 kilograms per hectare per year.

Deposition rates above this critical load value may cause adverse effects on species and communities in the park's high-elevation lakes. High-elevation ecosystems are particularly sensitive to effects from nitrogen deposition because they have short growing seasons, thin soils, and sparse vegetation, resulting in a very limited ability to assimilate excess nitrogen. In addition, a number of high-elevation lakes in the park have low acid-buffering capacity because the bedrock in the area is low in base cations like calcium and magnesium.

Jackson Hole Airport Contribution to Existing Deposition of Nitrogen and Sulfur in Sensitive Lakes in Grand Teton National Park

Nanus *et al.* (2005) identified 38 high-altitude lakes (with the Forget Me Not Lakes counting as two lakes) in Grand Teton National Park that may be sensitive to deposition of nitrogen and sulfur. To establish an existing conditions baseline, deposition modeling for each lake was performed using emissions data from the actual aircraft operations from October 2004 through September 2005 that were presented in Table 8, and actual weather conditions from the area that occurred in each of the five years from 2004 through 2008. Descriptions of the modeling procedures are provided in Chapter 4 and Appendix H. Complete results for predicted annual average deposition at all 38 lakes for the modeled existing conditions baseline are included in Appendix H.

Modeling showed that airport-related deposition decreased with increases in factors such as distance from the airport and from the flight path. However, the deposition analysis threshold value of 0.005 kilograms per hectare per year was exceeded by the predicted annual average deposition from emissions associated with the Jackson Hole Airport for both total nitrogen and total sulfur at all 38 lakes.

The lake designated Noname-55 was identified by modeling as currently having the greatest single-year levels of annual average deposition of both nitrogen and sulfur. Consistent with the approach throughout this air quality analysis of considering the maximum effects, deposition at this lake is described below. Lesser effects would occur at the other 37 lakes.

- The highest total nitrogen deposition values at Noname 55 because of emissions associated with the Jackson Hole Airport were modeled at 0.52 kilograms per hectare per year using 2007 weather conditions. This value is 100 times greater than the deposition analysis threshold and represents 8.9% of the estimated average 5.8 kilograms per hectare per year deposition level currently occurring for total nitrogen at high-altitude locations in Grand Teton National Park. This modeled value is the worst-case scenario for all lakes in the park, but is of concern and warrants potential mitigation, considering that the estimated deposition value of 5.8 kilograms per hectare per year already exceeds the critical value threshold of 1.5 kilograms per hectare per year that was identified earlier in this environmental impact statement.

- The highest modeled total sulfur deposition value at Noname-55, at 0.072 kilograms per hectare per year using 2007 weather conditions, is about 17 times higher than the deposition analysis threshold and represents 2.2% of the average 3.2 kilograms per hectare per year deposition level that is estimated to be currently occurring for total sulfur at park high-altitude locations.
- Deposition loads sometimes varied considerably with annual weather conditions. For example, at Noname-55, modeled predicted annual average deposition for total nitrogen ranged from 0.13 to 0.52 kilograms per hectare using 2008 and 2007 weather conditions, respectively. The modeled five-year average (2004 through 2008) at this lake was 0.26 kilograms of nitrogen per hectare per year. For total sulfur deposition, similar fluctuations were seen among years based on weather, from 0.018 to 0.072 kilograms per hectare per year, with a modeled five-year average of 0.037 kilograms of sulfur per hectare per year.

Four other lakes, including Amphitheater, Delta, Surprise, and Timberline, had modeled five-year average deposition rates for total nitrogen associated with airport emissions that were higher than the five-year average at Noname-55. The highest five-year average, at 0.33 kilograms of total nitrogen per hectare per year, occurred at Delta Lake. Fifteen lakes had modeled five-year average deposition rates for total sulfur that were higher than the five-year average at Noname-55, with Delta Lake again having the highest value, 0.049 kilograms per hectare per year of total sulfur. The model showed that changes in meteorological conditions among years resulted in less annual variation in deposition at these lakes than at Noname-55.

Based on these modeled results showing exceedences of the deposition analysis threshold significance levels, emissions associated with the Jackson Hole Airport contribute to the current estimated nitrogen deposition rate of 5.8 kilograms per hectare per year and the current estimated sulfur deposition rate of 3.2 kilograms per hectare per year. Modeled results show that the worst-case scenario for the airport's current contribution to the deposition rate may range from 6% to 8% for nitrogen and about 2% for sulfur (Delta and Noname 55 lakes). The other 36 lakes showed lower modeled values. The model used in this analysis was a conservative model that may have overestimated this contribution (Notar, personal communication 2010). A more refined model is expected to predict lower rates of nitrogen and sulfur deposition in the park caused by emissions from the airport, although results from this model would likely still show a considerable contribution from the airport that may warrant mitigation.

CLIMATE CHANGE

Climate change refers to any statistically significant changes in average climatic conditions (such as average temperature, precipitation, or wind) or climatic variability (such as seasonality or storm frequencies) lasting for an extended period of time (decades or longer). Recent reports by groups that include the U.S. Climate Change Science Program (2007) and the Intergovernmental Panel on Climate Change (2007a, 2007b) provide clear evidence that climate change is occurring and will accelerate in the coming decades.

The earth's atmosphere includes gases, both from natural sources and human activity. Some of these contribute to the greenhouse effect, which is a rise in temperature of the Earth's atmosphere as energy from the sun is trapped and radiated back to the planet. The gases that trap the heat and radiation are called greenhouse gases. Observed climate change is most likely a result of increased emission of greenhouse gases associated with human activity (Intergovernmental Panel in Climate Change, 2007a, 2007b).

Saunders *et al.* (2009) identified 11 types of risks of climate change to national parks. They range from higher seas and stronger coastal storms for coastal parks to a loss of ice and snow at high-elevation locations like Grand Teton National Park. Because climate change impacts are already occurring or are expected in the time frame of this agreement extension (Saunders *et al.* 2006, 2009), effects on climate change were included in this air quality analysis.

Laws, Regulations, and Policies

There currently are no federal or NPS climate change policies regarding the measurement of greenhouse gases by an agency and quantifying its potential effects on climate change. The Council on Environmental Quality (2010) published draft guidance on considering the effects of climate change and greenhouse gases emissions as part of the National Environmental Policy Act process. The guidance advises federal agencies to consider opportunities to reduce greenhouse gas emissions caused by their actions, adapt their actions to minimize climate change impacts, and address climate change issues in their National Environmental Policy Act procedures. In this context, climate change analysis should consider:

- The greenhouse gas emissions effects of a proposed action and alternative actions; and
- The relationship of climate change effects to a proposed action or alternatives, including the relationship to proposal design, environmental impacts, mitigation, and adaptation measures.

Global Greenhouse Gas Emissions

The principal greenhouse gases that enter the atmosphere because of human activities are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexa-fluoride. Emissions of greenhouse gases are typically expressed in a common metric, carbon dioxide equivalents, so that their impacts can be directly compared. The carbon dioxide equivalent for a gas is obtained by multiplying the tons of the gas emitted by its global warming potential over a 100-year time horizon. The global warming potential for carbon dioxide is 1, so that this gas would also have a carbon dioxide equivalent of 1. The global warming potential values for other greenhouse gases include 23 for methane, 296 for nitrous oxide, 120 to 12,000 for hydrofluorocarbons, 5,700 to 11,900 for perfluorocarbons, and 22,200 for sulfur hexafluoride (U.S. Environmental Protection Agency 2009d).

The global concentration of carbon dioxide has been increasing for the past 200 years, from a preindustrial concentration of about 280 parts per million. By 1970, human activities such as deforestation and the burning of coal, oil, and gas had increased the mean level of atmospheric carbon dioxide to 325 parts per million. Since 1979, the concentration of atmospheric carbon dioxide has increased at a rate of about 1.6 parts per million per year to the present level of approximately 385 parts per million (National Oceanic and Atmospheric Administration 2008).

The atmospheric concentrations of the other, more potent greenhouse gases also have increased to levels that far exceed their levels at the beginning of the industrial era. As of 2004, human activities annually produced more than 49 billion tons of greenhouse gases measured in carbon dioxide equivalency (Intergovernmental Panel on Climate Change 2007). Nearly every aspect of energy choice and use affects the cumulative total of greenhouse gas emissions.

Greenhouse Gas Emissions in North America and Teton County

North America is currently a net source of carbon dioxide to the atmosphere, contributing to the global buildup of greenhouse gases and associated changes in the Earth's climate. In 2003, North America emitted nearly two billion metric tons of carbon to the atmosphere as carbon dioxide. North America's fossil-fuel emissions in 2003 (1,856 million metric tons of carbon) were about 27% of global emissions, and 85% of those emissions were from the United States (U.S. Climate Change Science Program 2007).

The combustion of fossil fuels for commercial energy (primarily electricity) is the single largest contributor, accounting for approximately 42% of North American fossil fuel emissions in 2003. Transportation is the second largest, accounting for 31% of total emissions (U.S. Climate Change Science Program 2007). Within this sector, commercial and general aviation sectors represent between 2% and 3% of total global carbon dioxide emissions. Scheduled passenger and general aviation contribute about 1% and 1.6% of carbon dioxide emissions, respectively (U.S. Government Accountability Office 2009; U.S. Environmental Protection Agency 2010, *Inventory of U.S. Greenhouse Gas Emissions*).

The Community Foundation of Jackson Hole commissioned an inventory of emissions in Jackson Hole. The study area included Teton County, except the lightly populated areas west of Teton Pass. Emissions of greenhouse gas emissions in 2008 were estimated to total about 372,000 metric tons (410,228 short tons) carbon dioxide equivalent. Components of this total included ground transportation (62%), air travel and aviation (17%), combustion of natural gas and propane in buildings (12%), electricity use in buildings (5%), and other sources (4%), including miscellaneous fuel uses, landfills, nitrous oxide, and refrigerants (Heede 2009).

Climate Change in the Rocky Mountains

Although climate change is a global phenomenon, it manifests differently, depending on regional and local factors. Effects of climate change in the Rocky Mountain region of the western United States include loss of glaciers and reduced snowpack, contracting alpine vegetation communities, increased heat stress on high-elevation forest communities, and drought and fire-stress on sagebrush and other low-elevation communities.

Observed climate changes in the western mountains and forests bioregion, which includes Grand Teton National Park, include increased seasonal, annual, minimum, and maximum temperatures; altered precipitation patterns; and a shift toward earlier timing of peak runoff. These climatic changes have resulted in widespread mortality or stress in western forests; species range shifts and changes in the productivity and distribution of species; and an increase in wildfire severity, intensity, maximum fire size, and area burned.

Predicted regional changes include an increase in average temperature of around 0.3° C per decade over the next 50 years, dramatically reduced snowpack accumulation in western mountains, with commensurate reductions in runoff and natural water storage. Ecological changes likely to result from these climatic changes include continued shifts in species productivity and distributions; species extinctions; increased frequency, size, and duration of wildfires; increased drought length and severity; and range expansion of forest pests and pathogens (Loehman and Anderson 2009).

Climate Change in Grand Teton National Park

Saunders *et al*. (2006) identified Grand Teton National Park as one of 12 western national parks most at risk from climate disruption. Natural and cultural resources and visitor experiences specifically identified as being at risk include:

- Loss of glaciers and snowfields;
- Changes in water availability and quality;
- Changes in vegetation, such as shifting zones;
- Loss of forest health, which increases the risk of insects and disease outbreaks, such as mountain pine beetle and blister rust;
- Wildlife extinction and other effects, such as degradation of grizzly bear and pika habitats;
- Historical and archeological losses;
- Closed parks or park areas because of wildfire;
- Loss of fishing opportunity; and
- Loss of winter recreation.

Most of these changes are linked to forecasts of long-term increases in average temperatures, especially during the winter months, and potential changes in seasonal precipitation patterns, with a resulting future trend of increasing fire frequency and severity (Greater Yellowstone Science Learning Center 2009).

Grand Teton National Park has ongoing climate-change-related studies looking at wildlife, fire, vegetation, meadows, butterflies, birds, glaciers, and alpine lakes. The largest is an interagency study analyzing the effects of climate change and whitebark pine in the greater Yellowstone ecosystem. Whitebark pine is a key food source of several wildlife species, including the threatened grizzly bear (Greater Yellowstone Whitebark Pine Monitoring Working Group 2007)

Jackson Hole Airport Aircraft Operations Greenhouse Gas Emissions

Greenhouse gas emissions from aircraft operations at the Jackson Hole Airport were estimated using output from the Emissions and Dispersion Modeling System that was described earlier in this air quality section. All emissions of greenhouse gases were converted to carbon dioxide equivalent. In the modeled baseline period of October 2004 through September 2005, greenhouse gases from aircraft operations associated with the Jackson Hole Airport totaled 26,826 metric tons carbon dioxide equivalent.

Heede (2009) reported emissions from air travel and aviation at the Jackson Hole Airport at about 64,000 metric tons (70,000 short tons) carbon dioxide equivalent per year. However, he used a less precise approach that employed an Excel spreadsheet to estimate emissions based on estimated fuel use, route miles, and generalized fuel burn rates for different classes of aircraft.

The levels of greenhouse gas emissions that resulted from modeling of airport operations using the Emissions and Dispersion Modeling System and actual aircraft operations are used in the Chapter 4 analysis of impacts for each alternative. In addition to being based on more precise data than Heede's estimates, these values are directly comparable to the model outputs for airport operations for each alternative in 2015 and 2025.

Future Greenhouse Gas Emissions from the Jackson Hole Airport

Several other sources were not programmed in the greenhouse gas emissions model. Mitigation measures being implemented by commercial airlines and general aviation could substantially reduce greenhouse gas emissions from aircraft (U.S. Government Accountability Office 2009). These measures include using more fuel-efficient aircraft engines and airframes; becoming less energy intensive per passenger mile traveled (for example, flying more passengers per flight); using low-carbon alternative fuels; and making changes in air traffic management, such as reducing delays and congestion.

Carbon dioxide emissions from aircraft are a direct result of fuel combustion. Therefore, there is an economic incentive for the industry to reduce fuel consumption. Additional technological, operational, and alternative fuel improvements could help cut aircraft emissions in the future, although some could require years of development and could be costly. Progress could be accelerated by market incentives, research and development incentives, and policies that favor or mandate emissions reduction (U.S. Government Accountability Office 2009).

The Jackson Hole Airport is actively pursuing greenhouse gas reductions in their general operations. The Board recently issued a request for proposals to begin the process of pursuing ISO 14001 certification. Numerous actions that may be taken by the airport to reduce energy consumption were identified under "Mitigation Measures" in Chapter 2.

Park and County-Wide Greenhouse Gas Reduction Goals

Grand Teton National Park is committed to reducing its ecological footprint and greenhouse gas emissions through energy and water conservation measures, green purchasing, green building, education and outreach, and an expanded recycling program. The park has committed, as part of the Greater Yellowstone Coordinating Committee, to a 20% reduction of greenhouse gases related to park operations by 2012.

The Town of Jackson and Teton County are also pursuing greenhouse gas reduction goals. The Jackson Hole Energy Sustainability Project is a town, county, and utility partnership with the mission to make Jackson Hole a leader in energy efficiency and energy innovation. In August 2010, Teton County and the Town of Jackson voters elected to fund the Jackson Hole Energy Sustainability Project Specific Purpose Excise Tax in the amount of $3.79 million. The Jackson Hole Energy Sustainability Project will use this money to fund energy efficiency retrofits and distributed renewable energy generation in the county.

VISUAL QUALITY AND DARK SKIES

VISUAL QUALITY

Visual quality is a fundamental resource of Grand Teton National Park. In the *Master Plan, Grand Teton National Park, Wyoming* (NPS 1976):

- The "Purpose" section begins by stating, "Grand Teton was established as a unit of the National Park System to protect the scenic and geologic values of the Teton Range and Jackson Hole."
- Visual quality is the first subject discussed under "The Resource," which begins, "Towering 7,000 feet above the sagebrush flats of Jackson Hole, the granite peaks of the Teton Range dominate the park landscape." It then proceeds to describe some of the visual features that contribute to the outstanding landscape.

U.S. Highway 26/89/191 is the most common viewpoint in the park from which the Jackson Hole Airport is observed. This highway runs generally north-south about a half-mile east of and parallel to the runway. The terminal and other airport buildings are about 0.3 mile from the highway. Therefore, observers from the highway see the airport features in the midground view as they look west or northwest toward the Teton Range peaks. These features blend fairly well with the surroundings in terms of color, form, line, and texture.

- The paved runway, taxiway, and parking areas are below the visual horizon observed from the road. Park visitors traveling on the highway or stopped at turnouts cannot see these large airport features.
- The airport buildings present vertical lines in comparison to the horizontal lines of the landscape. However, except for the tower, the maximum building height is 27 feet. The low heights of the buildings and their distances from the highway serve to diminish the visual effect. The subdued brown, gray, and green colors of the buildings blend with the gray-green of the sagebrush flats that surround the airport. The smooth texture of the buildings is inconsistent with the roughness of the surrounding vegetation, but the difference is not prominent because of the substantial distance from the buildings to observers on the highway.
- The visible airport features appear to follow the land form in their alignment that is generally parallel with the highway, the distant Snake River, and the more distant Teton Range.

From the intersection of U.S. Highway 26/89/191 and the airport road turnoff, a private housing development just south and west of the park boundary is in visual alignment with the hangars and other buildings in the south part of the development subzone. As shown in the photographs on pages 139 and 140, these private buildings outside the park are visually evident in the mid-ground view beyond the airport structures.

Movement associated with the airport, particularly the movement of low-flying aircraft that are landing or taking off, increases airport visibility and perception in the landscape. This is particularly true for large jets, which draw attention both because of their size and sound. During each of the large air carrier takeoffs or landings, the visual scene for an observer on the highway may be dominated for a couple of minutes by the aircraft (although the presence of the aircraft in a particular location, such as a picture of the Teton Range that the observer is composing, would last a few seconds). Large general aviation aircraft have a similar effect. Depending on their sound emissions and the attentiveness of the observer, smaller, propeller-driven or jet aircraft could have similar dominance over the scene, or could be virtually unperceived in their use of the airport and surrounding airspace.

Measuring Visual Quality

The National Park Service is in the process of developing a standard method for measuring visual quality but it is not yet available. Therefore, the well-established approach of the U.S. Forest Service (1995) was adopted for describing existing conditions and analyzing impacts. This approach involves managing areas to meet target scenic integrity levels that include:

- Very high: Refers to landscapes where the valued landscape character "is" intact with only minute, if any, deviations. The existing landscape character and sense of place is expressed at the highest possible level.
- High: Refers to landscapes where the valued landscape character "appears" intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident.
- Moderate: Refers to a landscape where the valued landscape character "appears slightly altered." Deviations must remain visually subordinate to the landscape character being viewed.
- Low: Refers to landscapes where the valued landscape character "appears moderately altered." Deviations begin to dominate the landscape character being viewed but they borrow valued attributers such as size, shape, edge effect and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed. They should not only appear as valued character outside the landscape being viewed but compatible or complementary to the character within.
- Very low: Refers to landscapes where the valued landscape character "appears heavily altered." Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect and pattern of natural openings, vegetation type changes, or architectural styles within or outside the landscape being viewed. However, deviations must be shaped and blended with the natural terrain (landforms) so that elements such as unnatural edges, roads, landings, and structures to not dominate the composition.
- Unacceptably low (or no scenic integrity): Refers to landscapes where the valued landscape character being viewed appears extremely altered. Deviations are extremely dominant and borrow little if any form, line, color, texture, pattern, or scale from the landscape character. This level is used by the U.S. Forest Service only to inventory existing integrity and is not used as a management objective.

Visual Quality in Grand Teton National Park near the Jackson Hole Airport

Junction of U.S. Highway 26/89/191 and Airport Road. From the viewpoint at the junction of U.S. Highway 26/89/191 and the airport road, shown in the left photo on page 93, the scenic integrity of the background view in all directions is very high. The scene is dominated by the highly valued natural landscape of the Teton Range to the west and northwest and by the equally undisturbed but less dominating landscape of Blacktail Butte and the Gros Ventre Range east of the highway.

The foreground view at this location has very low to no scenic integrity. The nearby visual scene is dominated by the pavement of U.S. Highway 26/89/191 and the airport road. However, because of the overwhelming scenic presence of the Teton Range and the ubiquity of roads, many observers may not note the adverse effect of the roads on the natural landscape character unless it is pointed out.

The midground view west of the airport road junction includes the airport terminal and other buildings in the development subzone. Because of the distance, low height of the buildings, and use of natural colors, these structures remain visually subordinate to the landscape character being viewed and maintain moderate scenic integrity. North of the development subzone, the area of runways and taxiways generally gives the appearance of an intact sagebrush plain (high scenic integrity).

The midground view to the southwest includes a housing development outside the park. In this area, there has been less concern about blending with the landscape character. However, the contrast with the natural scene is attenuated by distance, and the scenic integrity in this direction is classified as moderate or low.

Viewpoints along the Airport Road and within the Airport Boundary. As observers travel the 0.3-mile-long road from U.S. Highway 26/89/191 to the airport parking lot, the airport-related structures become more visually dominant (photo on right, below and on next page). Within the development subzone, there is no scenic integrity in either foreground or midground views (photo on next page). The background view continues to be dominated by the Teton Range, but the observer must look beyond the nearby, human-altered setting. Nevertheless, captions for photographs of the mountains taken from within the development subzone and posted on the Internet exclaim about the beauty of the background setting and attest to its high scenic integrity, despite the absence of foreground and midground scenic integrity.

Pavements of the U.S. highway and airport road (shown here) dominate foreground views. The airport buildings, in the photo center, are visually subordinate to the natural landscape character.

Even at close range, the height restrictions and natural colors used throughout the airport help the buildings blend into the natural landscape.

From viewpoints along the airport road, the 50-foot-tall control tower appears visually consistent with the other buildings. From viewpoints farther north along U.S. Highway 26/89/191, the tower contrasts with the otherwise high scenic integrity of the landscape. The runway and taxiway, which are between the photographer and tower, cannot be been from U.S. Highway 26/89/191 or the airport road.

Viewpoints North of the Airport Road Junction. For observers north of the airport road along U.S. Highway 26/89/191, the foreground view continues to be dominated by the presence of the pavement and has very low to no scenic integrity. The background view in all directions and the midground view to the east are dominated by the very high scenic integrity of the unaltered natural landscape. To the west, the taxiway and runway less than a half-mile distant are not visible (photo above, right) and, except for the presence of the control tower, the area has high scenic integrity. To the southwest, the buildings in the airport's development subzone and in the housing development outside the park visually merge and fade in the distance, providing a moderate level of scenic integrity. These structures have little or no visibility from highway viewpoints beyond the north boundary of the airport, where the scenic integrity of the midground view is high or very high.

The residential development south of the airport is visible in the midground from the park entrance turnout, but the attention of most visitors is focused on the visually dominant Teton Range.

Even within the development subzone where the foreground and midground have no scenic integrity, the Teton Range dominates the landscape.

Viewpoints South of the Airport Road Junction. Beginning at the park entrance turnout on U.S. Highway 26/89/191 about 4 miles from of the airport road junction, the landscape is dominated by the very high scenic integrity of the Teton Range. Midground views to the west and southwest between this turnout and the Airport Road Junction, especially north of Gros Ventre Junction, include the residential development outside the park boundary and have low scenic integrity. Toward the northwest, the natural colors of the airport buildings blend with the landscape and maintain moderate scenic integrity. Midground views to the east include the National Elk Refuge which, depending on the season, can appear as a high-integrity natural meadow or a heavily grazed field with moderate scenic integrity. North of the elk refuge, the scenic integrity of the midground landscape to the east is high to very high. The foreground view has very low to no scenic integrity and is dominated by the road pavement and the tall wire fence that prevents animals on the National Elk Refuge from wandering onto the road.

DARK SKIES

Sources of Light Pollution

For the Native Americans and early pioneers who inhabited the Jackson Hole and Grand Teton National Park area, the natural lightscape was dominant throughout the night. The area's high elevation, with the entire park more than 6,000 feet above sea level, and the dry climate contributed to the clarity of the night sky.

Until the 1930s, the natural lightscape was little changed from its historic character. However, since then, the use of electric lights has proliferated in concert with the development of the area. Important sources of artificial exterior lighting include the following.

- The Jackson Hole Airport, where exterior lighting for navigation must be directed skyward. External lighting also is used on some buildings, particularly around doorways, in parking areas for automobiles and aircraft, and along pedestrian walkways. The Jackson Hole Airport Board is aware of concerns about fugitive light and has taken cooperative measures with the National Park Service to limit light losses. For example the Board:
  - Installed a system that enables pilots turn on the runway lights by radio. The lights stay on for 15 minutes and then turn off.
  - Reduces light emissions from the automobile parking lot by turning off three of the four rows of lights at about 9:30 P.M.
  - Recently (2007) installed 4-inch light-shield boxes on all of the ramp lights except to the west (the direction facing approaching aircraft). Ramp lights must be on all night for security.
  - Routinely requests that an NPS lighting specialist review all proposed changes in exterior lighting and then makes modifications to reduce light emissions based on the expert's recommendations.
- The Town of Jackson, where exterior lighting primarily is associated with streets, outdoor recreation facilities such as ball fields, and commercial development, including parking lots and signs. Chapter 4 of the *Jackson/Teton County Comprehensive Plan* (2002) has a general recommendation that exterior lighting be controlled to protect scenic vistas. Detailed requirements to control fugitive light emissions are included in Appendix A, section 49370 of the Town of Jackson Municipal Code.
- The Snow King Resort on the south side of the town of Jackson. During the winter, this resort has lighted night-skiing runs and uses nighttime grooming equipment, making it highly visible to passengers on aircraft flying overhead.
- The Jackson Hole Mountain Resort and Teton Village at its base. These developments are off the Moose-Wilson Road approximately 5 miles west of the Jackson Hole Airport. Exterior lighting is

particularly evident in winter and primarily illuminates parking lots and commercial facilities. Jackson Hole Mountain Resort, Teton Village, and all other areas of commercial and recreational development outside the town limit of Jackson are subject to the fugitive light control requirements in section 49370 of the Teton County Development Regulations.

For a relatively isolated community like Jackson, the artificial illumination of the night sky at a 45-degree angle in the direction of the city varies as the inverse 2.5 power of distance from the city (Walker 1977).

Appendix A, section 49370 of the Town of Jackson (1995) Municipal Code contains external lighting and glare standards to control fugitive light emissions. Similar requirements are included in section 49370 of the Teton County Development Regulations (Teton County 1994). For most sources, the standards limit the height of light fixtures to 18 feet or less. They also require total cut-off of light at an angle of less than 90 degrees, complete shielding of the light source from direct view at the perimeter of the lighted area, and containment of the light entirely onsite. Exceptions are provided by the town and/or county for outdoor recreation facilities such as ball diamonds, outdoor rinks, ski areas, and tennis courts, and for some commercial development such as gas stations. However, even these areas are limited to a maximum light-pole height of 40 feet, the light source must be shielded, and the light must meet all of the other standards in the current edition of the Illuminating Engineering Society of North America's *IESNA Lighting Handbook*. Flickering or flashing lights, search lights, and strings of lights other than decorative lighting during designated seasons around Christmas are prohibited by the town and county.

The town and county standards have been in effect since the mid-1990s. Although neither requires compliance from fixtures installed before then, most large commercial establishments have installed light emissions controls because they upgraded their exterior lighting in the past 10 years. As a result, virtually all large, illuminated commercial sites in Jackson, such as store parking lots and automobile dealerships, currently meet the town's control standards for lighting (Grubb 2006).

Automobile headlights are mobile sources of light pollution that are associated with the airport. This is particularly true during the winter, when the sun sets before 5:00 P.M. (compared to summer sunsets that occur after 9:00 P.M.). Automobiles of airport passengers and workers also represent a much greater percentage of the vehicles on the road during the winter, when there are few other night drivers in the park. Automobile headlights can create a noticeable impact on the natural lightscape when an observer is aligned with a road. However, nighttime automobile traffic on northwest Wyoming roads is intermittent and is restricted to road corridors. As a result, except along highways, automobile headlights do not contribute substantially to reductions in dark skies.

The interagency helibase is the only NPS-owned light source in the airport area. The lights at this facility are turned off except when this facility is actively supporting safety and resource management activities, such as fire suppression or search and rescue missions. Except for aircraft operations lighting, all light fixtures at the helibase meet NPS standards for preventing fugitive light emissions. As a result, NPS facilities are a minor source of light pollution in the airport vicinity.

Measuring Light Pollution

The system for describing the visual magnitude (brightness) of astronomical objects dates back to Greek astronomers who rated brightness on a scale of 1 to 6, with the brightest being 1. The system is still used today, although with a mathematical definition: a star of a specified apparent visual magnitude is slightly greater than 2.5 times brighter than the next fainter magnitude (Kaler 2005).

The National Park Service is currently developing a preliminary approach for measuring light pollution in parks (Duriscoe *et al*. 2007). However, this protocol has not been finalized and approved for use in NPS documents prepared for compliance with the National Environmental Policy Act. Therefore, it was not used for the analysis presented in Chapter 4. Other large land management agencies, such as the U.S. Forest Service or Bureau of Land Management, also do not have techniques that could be readily adapted to this analysis. Therefore, this analysis used a light pollution measurement technique developed by the International Dark-Sky Association (1997) that is based on the apparent visual magnitude of stars. They used the magnitude of visible stars to define levels of light-polluted "sky," an approach that can be readily understood and applied by the general public. Under this system:

- A magnitude +7.0 sky occurs at an extraordinarily dark site, where up to 7,000 stars as faint as visual magnitude +7.0 can be seen by experienced observers with good eyes.
- A magnitude +6.0 sky is a reasonably good sky, with approximately 2,400 stars visible to the unaided eye. There is some light pollution, and it is usually enough to illuminate clouds so that they no longer appear utterly black against the sky as with a magnitude +7.0 sky. The brighter parts of the Milky Way are readily seen.
- A magnitude +5.0 sky is affected by moderate light pollution, with approximately 800 stars visible. The Milky Way is barely visible, if at all.
- In a magnitude +4.0 sky, fewer than 250 stars are visible and the Milky Way cannot be seen. Light pollution is a serious problem.
- A magnitude +3.0 sky shows fewer than 50 stars, and light pollution is severe. This is the typical sky encountered inside a major city.
- A magnitude +2.0 sky will show fewer than 25 stars and is typical of central regions of cities.

Light Pollution at Grand Teton National Park and the Jackson Hole Airport

Despite the sources of light pollution identified previously, night skies in Grand Teton National Park in the Jackson Hole Airport area continue to have excellent visibility. The International Dark-Sky Association's DarkSky map shows a limiting magnitude of +6.7 or +6.8 for all of the 25 sites listed within about 10 miles of the Jackson Hole Airport. These findings correlate well with the analysis of sky quality reported by Albers and Duriscoe (2001), which indicated that 99.5% of Grand Teton National Park has a zenithal limiting magnitude between +6.76 and +6.81.

- Within and immediately adjacent to the airport's development subzone, there is substantial light pollution that greatly reduces the visibility of night skies. In lighted areas such as parking lots, few stars are visible and the sky is rated at about magnitude +3.0 or +4.0.
- In a zone beyond the actual lighted areas, the visibility rating of the night sky at the airport is about magnitude +5.0.
- Near the south end of the airport, which is adversely affected by light pollution from development outside the park boundary, the visibility rating of the night sky is about magnitude +5.0.
- Areas within the airport boundary that are more distant from the development subzone, including many areas north of the development subzone, have visibility ratings of magnitude +5.5 to +6.0.

WATER QUALITY AND HYDROLOGY

SURFACE WATER FEATURES AND HYDROLOGY OF THE AIRPORT

The Jackson Hole Airport is on a flat outwash plain between the Snake and Gros Ventre Rivers. The area slopes gently down from north to south, with a 38-foot drop over the 6,300-foot-long runway (0.6% grade).

The only water feature within the airport boundary is the Enterprise Canal, an irrigation ditch near the south end of the runway. It flows east-west from the Gros Ventre River, across the airport, to lands to the west that hold the water rights. Surface water from the airport does not enter the Enterprise Canal. Instead, water from the airport's ramp drainage and treatment system (described below) is routed under the Enterprise Canal and into an area of sagebrush flats about 200 yards south of the canal. There are no direct surface water discharges from the airport property to the Snake River or Gros Ventre River.

The runway, taxiway, parking areas, buildings, and airport road represent large, impervious surfaces that can produce runoff from warm-season storms. However, the long, narrow configurations of many of these features and the flat topography minimize the volumes of runoff that are discharged to any location. Moreover, once it moves off the impervious surfaces, storm water rapidly infiltrates into the highly permeable glacial outwash that underlies the airport. The absence of runoff channels or surface soil erosion, despite the 65-year presence of the airport, indicates that adequate runoff control is occurring.

The ramp area is the area where water is most likely to come in contact with pollutants such as gasoline, oils, and greases. Therefore, all of the runoff from this area flows by gravity into drains that lead through four oil/water separators. If a spill is known to have occurred, the drain system can be blocked at a number of points, and the substance and any water it has contaminated are retained on the upgradient, impervious surface until they can be collected and treated.

Snow starts accumulating in the airport area in late autumn. Snowplowing is used to remove the snow from the operational surfaces of the airport throughout the winter. Chemical deicers are not used for surface snow removal anywhere on the airport property. The snow is piled in designated storage areas, located on the north and south ends of the ramp and in areas east of the hangars, east of the fixed-base operator building, and east of the passenger parking area along the airport boundary. By the end of winter, these piles can collectively cover 2 acres or more.

The snow piles melt throughout the spring and often into the early summer. Snowmelt from most of the piles is quite clean. Therefore, it is allowed to run off the paved surface and percolate into surrounding soils. Any sediment or gravel left on the pavement is swept up and disposed of properly.

Snowmelt from the piles at the north and south ends of the ramp area includes propylene glycol from aircraft deicing (although much of this chemical evaporates or biodegrades to simple, nontoxic compounds, primarily methane and carbon dioxide (Johnson *et al.* 2001)). It also contains the accumulated drips of oil and other substances that have occurred throughout the winter. Therefore, these piles are located so that all of their runoff enters the ramp drainage and treatment system described previously. Typically, some surface melting occurs before the drains thaw. As a result, the water collects in a pool up to 1.5 feet deep atop the pavement at the south end of the ramp. The paved surface area is adequate to collect this melt water, and untreated water does not flow off the ramp.

WATER QUALITY STANDARDS

Wyoming water quality standards are available on the Internet at the Wyoming Department of Environmental Quality site at <http://deq.state.wy.us/wqd/WQDrules/Chapter_01.pdf>. Wyoming Water Quality Rules and Regulations include numeric standards for surface water but not for ground water.

The entire length of the main stem of the Snake River upstream from the Wyoming Highway 22 bridge (Wilson Bridge), including the river stretch near the Jackson Hole Airport, is classified as “Class 1, Outstanding Waters.” The Snake River is about 1.5 miles west of the airport.

The Gros Ventre River upstream from its confluence with the Snake River is designated by Wyoming as Class 2AB for cold water game fisheries. The Gros Ventre River is about 2 miles east of the airport.

Within the Wyoming Water Quality Rules and Regulations, an antidegradation standard is included in section 8 of Chapter 1, Wyoming Surface Water Quality Standards. Under a permit system, it allows for some decrease in water quality as long as specified conditions continue to be met. However, the antidegradation standard does not apply to the Snake River in the vicinity of the airport because no further degradations of Class 1 waters are allowed.

Under the antidegradation standard, surface waters (other than Class 1) whose quality is better than the standards they are required to meet must be maintained at that higher quality. However, the state may issue a permit for a project or development to increase levels of water pollution as long as the resulting water quality is not below the standards, existing water uses are maintained and protected, best management practices are implemented, and important economic or social benefits are produced. The Gros Ventre River near the airport could be subject to these antidegradation standards.

REGIONAL SURFACE WATER RESOURCES

Surface Water Hydrology

The Snake River is the principal stream in Teton County and the park. It flows generally from north to south, and its flow is regulated by Jackson Lake Dam, about 25 miles north of the airport.

Mean discharge in the Snake River upstream from the airport at Moose is 3,011 cubic feet per second for water years 1995 through 2005. During this time, daily flows ranged from a low of 600 cubic feet per second in February 2003 to a high of 24,500 cubic feet per second in June 1997. The typical flow pattern generally includes a flow of about 1,000 cubic feet per second for the period from October through March. Spring and early summer snowmelt and rain increase flows to between 5,000 and 10,000 cubic feet per second, but much higher flows can occur for short periods. By mid-summer, flows are about 2,500 cubic feet per second, and they gradually decrease until they stabilize for the winter season (U.S. Geological Survey 2005).

The gauging station downstream from Flat Creek (and the airport) has a period of record from 1976 through the present. At this site, the Snake River carries the discharge of the Gros Ventre River, Flat Creek, and several smaller tributaries. Mean flow at this site is 3,576 cubic feet per second with a range from 690 cubic feet per second in January 1988 to 30,200 cubic feet per second in June 1997. The annual flow pattern at this site is similar to that described for the Moose gauge (U.S. Geological Survey 2005).

The Gros Ventre River is a tributary of the Snake River. The gauging station on this river is about 2 miles upstream from its confluence with the Snake River and about 4 miles south (downstream) of the airport. The discharge record for this waterway dates back to 1917 but is incomplete, with no winter record. Flows range from no flows on many days in some years, particularly during the winter and early spring, to 6,710 cubic feet per second in June 1997 (U.S. Geological Survey 2005).

Surface Water Quality

Woods and Corbin (2003) characterized surface water quality in the Snake River at Moose based on existing data, while Clark *et al.* (2004) performed new water quality sampling and analyses. Both papers evaluated data sets of about 30 samples, and both had similar conclusions. The following statements are from Clark *et al.* (2004):

- Monitoring at sites on the Snake River in Grand Teton National Park during water years 1998-2002 indicate that water generally is of good quality.
- Concentrations of nutrients generally were low. Concentrations of dissolved ammonia, nitrite, and nitrate in all samples collected from the Snake River were less than the water-quality criteria for surface waters in Wyoming.
- Concentrations of trace metals were low in samples collected from the Snake River.
- Concentrations of all analyzed pesticides were less than the reporting level in 27 samples from the Snake River.

Because there are no significant sources of water pollution between Moose and the airport, the Snake River closest to the airport would be expected to have similarly high water quality.

REGIONAL GROUND WATER RESOURCES

Ground Water Hydrology

The Jackson Hole Airport is constructed on alluvium that occurs as flood plain deposits of well-sorted beds of silt, sand, and gravel. The alluvium is outwash material that was deposited by the flow from melting glaciers. Outwash deposits are quite permeable and yield water easily to wells. In contrast, moraine deposits contain more clay and silt, resulting in better retention of soil moisture and nutrients. Consequently, the moraines are heavily forested, while outwash plains such as the airport site are covered by sagebrush (Woods and Corbin 2003).

Ground water in the vicinity of the Jackson Hole Airport is hydraulically connected to Snake River. The U.S. Geological Survey's geologic map of Grand Teton National Park identifies the plain on which the airport is located as "abandoned channel" with a direction of ground water flow that is parallel to the flow of the Snake River (Love 1992).

Records for selected wells in Teton County were provided by Nolan and Miller (1995). These included four wells in the quarter section that includes the airport's development subzone. All four wells had depths to water, measured in July 1992 or July 1993, between 31 and 36 feet below ground surface. Estimated discharges were provided for two of the wells and ranged between 80 and 100 gallons per minute.

Ground Water Quality

Virtually all domestic, municipal, and commercial water supplies in Teton County utilize ground water (Jorgensen Engineering and Land Surveying, P.C. 1999). This includes the town of Jackson, which supplies its citizens from seven wells in the alluvial aquifer, and the Jackson Hole Airport. The ground water quality is excellent, and consistently meets or exceeds federal and state standards for drinking water (Town of Jackson 2006).

WATER QUALITY AND WATER PROTECTION MEASURES AT THE JACKSON HOLE AIRPORT

Since the 1930s, chemicals that have the potential to affect water quality have been stored and used at the Jackson Hole Airport. Primarily, these include fuels, propylene glycol aircraft deicer, lubricants, and solvents for cleaning. Domestic wastewater and wash water are produced by the airport car rental facility.

All of these substances have a low potential to pollute surface waters because of the long distances to water bodies (1.5 miles to the Snake River and 2 miles to the Gros Ventre River) and the flat topography. Management measures that are implemented to prevent pollution of ground water are presented below.

National Pollutant Discharge Elimination System Permits for the Airport

Section 402 of the Clean Water Act prohibits the point-source discharge of pollutants into waters of the United States unless a permit is obtained. Point sources are discrete conveyances such as pipes or man-made ditches. In Wyoming, National Pollutant Discharge Elimination System permits are issued by the Department of Environmental Quality. Each permit specifies the types and amounts of pollutants that may be discharged at the specified discharge point.

Two National Pollutant Discharge Elimination System permits allow discharges in association with the operation of the Jackson Hole Airport:

- Permit #UIC99-125 allows the discharge of up to 7,514 gallons of wastewater per day to the Snake River aquifer through septic tank and leach field systems at the Jackson Hole Airport. These wastewaters must have received treatment in an adequately designed and maintained septic tank and leach field system prior to discharge to the aquifer.
- Permit #WYS000002 is for the discharge of storm water. There is no volume associated with this permit because of the variable nature of storm water runoff. This discharge permit is for the runoff from the ramp area, which is collected in drains and routed through four oil/water separators. The discharge point is about 200 yards beyond the Enterprise Canal, south of the runway.

There have not been any violations relating to either of these permits.

Hazardous Materials Management Plans

A hazardous materials management plan is included in the Jackson Hole Airport procedures manual. This document provides general approaches for the proper management of hazardous materials that are being used at the airport, identification of responsibilities for spill cleanups, and reporting requirements for spills, including reporting to the Wyoming Department of Environmental Quality.

The hazardous materials management plan is supplemented by more detailed procedures in a spill prevention, control, and countermeasure plan that conform with Title 40, *Code of Federal Regulations*, Part 112. This plan, which was last updated in March 2003, includes such information as the types and volumes of materials stored at the airport, discharge prevention measures that have been implemented to prevent spills or leaks during routine handling of products, discharge drainage controls, measures for response and cleanup, methods for disposal of recovered materials, contact lists and phone numbers, training, designation of accountable personnel, and security.

The National Park Service prepares a park-wide environmental management system plan that functions like a hazardous materials management plan. This plan for all park facilities, including the interagency helibase at the airport, was updated in November 2005. It also is supported by a spill prevention, control, and countermeasure plan that is specific to the helibase operations.

Fuels Management

Fuels for aircraft and automobiles are delivered in bulk and stored in underground tanks in four fueling systems at the airport.

- The south fuel farm, which was installed in 1991, and the separate but adjacent north fuel farm, which was upgraded in 2003, store several types of aviation fuel. Both fuel farms are within the development subzone and are managed by the fixed-base operator.
- Gasoline for rental cars is stored in an underground tank system within the development subzone west of the aviation fuel farms.
- The underground fuel storage system for the interagency helibase was installed north of the development subzone in 2004 and is operated by the National Park Service.

All of these are modern systems that conform with the design, construction, operation, and monitoring requirements of the Wyoming Department of Environmental Quality storage tank rules in Chapter 17 of the state's water quality rules and regulations and the U.S. Environmental Protection Agency requirements in Title 40, *Code of Federal Regulations*, Parts 280 and 281. Monitoring wells within the fuel farms and at downgradient locations to the south and southwest are tested and reported in conformance with Wyoming Department of Environmental Quality requirements. Inventory control records and monitoring results confirm the integrity of these systems and the absence of leaks that could contaminate ground water.

Any spill of more than 25 gallons must be reported promptly to the Wyoming Department of Environmental Quality. Engineered components of the fueling systems such as automatic cut-off switches and overfill protection have almost completely eliminated such spills. Two reportable spills have occurred over the past 15 years, one of about 100 gallons and one involving several hundred gallons of fuel. Both spills were caused by deliberate tampering to circumvent dead-man's switches. Each incident resulted in immediate job loss by the offending individual, and the switches have been redesigned to make them more tamper resistant.

For each spill, a representative of the Wyoming Department of Environmental Quality provided onsite direction regarding the excavation and treatment of the contaminated soil. All remediation was completed in accordance with their instructions and to their satisfaction.

The site of the larger spill was completely excavated several years later when the north fuel farm was upgraded in 2003. Also during that upgrade, a small area of contaminated soil was found under one of the old tanks that was being replaced. All soil with evidence of staining was removed and replaced with clean fill before the new system was installed. There was no indication that fuel from the earlier spill or from the tank leak had migrated through the vadose zone into the ground water system.

Industry-recognized best management practices are used from the time fuel is brought onto the airport property until it is dispensed into aircraft or automobiles. Despite these practices, fuel spills of 5 gallons or less occur occasionally, particularly in association with the transfer of fuel from trucks to aircraft. All of the fuel trucks carry absorbent materials capable of handling these situations. The spent absorbent is disposed of properly offsite. Because these incidents occur on impervious surfaces, the fuel does not enter the soil or underlying ground water. Any residual fuel that was not cleaned up or that did not evaporate and that was picked up by storm water runoff would be removed when the water passed through the oil/water separators.

All personnel involved in the management of fuels at the Jackson Hole Airport receive extensive training, in conformance with Federal Aviation Administration requirements. Additional training is required for personnel in supervisory positions for fuels handling.

The fueling systems at the Jackson Hole Airport are subjected to a rigorous annual inspection by the Federal Aviation Administration, with participation by the National Park Service. Some of the many features that are inspected include labeling, valves, fire extinguishers, protective fire walls, and potential ignition sources. The fixed-base operator at the Jackson Hole Airport consistently has high scores, and did not receive any violations or notices in the most recent inspection.

Propylene Glycol (Deicer Fluid) Management

In the winter, the Jackson Hole Airport staff uses propylene glycol to remove the snow and ice from aircraft. Deicer use at the airport is limited exclusively to aircraft. All snow and ice removal from pavement and other surfaces is accomplished by mechanical means, such as plowing and sweeping.

Some other airports use a similar compound, ethylene glycol, as a deicer, and both propylene glycol and ethylene glycol are commonly called “glycol.” However, numerous health risks are associated with exposure to large amounts of ethylene glycol. As a result, the U.S. Environmental Protection Agency has set a drinking water guideline for ethylene glycol of 7,000 micrograms per liter of water for an adult person. In contrast, propylene glycol is so safe that it is classified by the Food and Drug Administration as an additive that is acceptable for use in food (Agency for Toxic Substances and Disease Registry 1997), and there is no drinking water standard. Because of the difference in safety, the Jackson Hole Airport Board has elected to use only propylene glycol at the airport.

Propylene glycol is not likely to exist in large amounts in air, where it has a half-life of one or two days. The compound breaks down within several days to a week in water and soil (Agency for Toxic Substances and Disease Registry 1997). Propylene glycol degradation products are primarily methane and carbon dioxide, which have low levels of environmental toxicity.

Propylene glycol deicers also contains small amounts of additives, which vary among manufactures and typically are proprietary. Despite the presence of additives, soil application has been proposed as a means of disposal for propylene glycol-based aircraft deicing fluids. Bausmith and Neufeld (1999) found that biodegradation of solutions of less than 20% by weight could be degraded in the soil profile.

Propylene glycol deicer is stored in an aboveground, double-walled, 20,000-gallon tank north of the terminal. There is no secondary containment (such as a berm or dike) around the deicer storage tank. However, its aboveground configuration makes it easy to inspect to confirm that it is in good condition with no leaks. In the event of a breach, such as an impact by a truck, the deiced compound would flow onto the gently sloping, paved ramp and into the ramp drainage system for collection and treatment.

In the winter of 2005/2006, 93,000 gallons of concentrated propylene glycol deicer were used for aircraft deicing at the airport. Prior to use, the propylene glycol is mixed with water to create a concentration specified by the airline, usually 50/50 or 60/40. Several hundred gallons of the deicing fluid can be sprayed on a single, large plane that is sitting on the ramp, ready for takeoff.

There currently are no regulations regarding the use of glycol deicers at airports. However, the U.S. Environmental Protection Agency (2009 FR 74(166)) has proposed effluent limitation guidelines and new source performance standards under the Clean Water Act for discharges from airport deicing operations. The requirements would be incorporated into an airport's National Pollutant Discharge Elimination System permits (which were discussed previously in this section). As currently proposed, the rule would require airports to collect at least a specified proportion of available deicing fluid after it is sprayed on aircraft, and meet a specified numeric effluent limit for deicing fluid wastewater.

Indications that the U.S. Environmental Protection Agency was moving toward regulating deicing fluids prompted the Jackson Hole Airport Board to investigate methods for reclaiming or reducing the use of this material (Hatch 2006). Since the winter of 2007/2008, used deicing fluid at the Jackson Hole Airport has been collected using a vacuum truck. It is sent to a Salt Lake City recycling facility where the propylene glycol is separated from contaminants using reverse osmosis and distillation, and is reused for any purpose other than in food products. Propylene glycol is relatively expensive, so in addition to concerns about environmental protection and regulatory compliance, the Jackson Hole Airport has an economic incentive to maximize used deicing fluid recovery and recycling.

The airport's capital improvement plan currently includes a project to construct a deicing pad to collect and recover propylene glycol. When completed, this system will further reduce the potential for introducing propylene glycol into the environment.

Any remaining deicing fluid flows across the ramp by gravity to the area of the drainage system. However, because the drains often are frozen in winter, it typically flows on the pavement surface to the low, south part of the ramp. It accumulates there, along with melt-water from the intermittent thawing as the pavement heats in the sun, in a sometimes-frozen pool that can be up to 1.5 feet deep. Throughout this time, much of the remaining propylene glycol evaporates or biodegrades to carbon dioxide and methane. In the spring when the drains thaw, the remaining propylene glycol is routed, along with large volumes of snowmelt water, through the oil/water separators for treatment and then into the sagebrush flat south of the runway.

Despite this product's low environmental toxicity and short half-life, concerns have been raised by airport neighbors regarding the potential for deicing fluid to affect nearby ground water resources. The airport is cooperating with the Wyoming Department of Environmental Quality in testing soils south of the ramp area for the presence of propylene glycol and deicer additives. It is also working with the U.S. Geological Survey to determine if there is any transport of deicing fluid constituents off the airport site.

Management of Oils, Greases, and Solvents

Performing aircraft maintenance, such as changing oil, has been prohibited on the airport ramps for more than 20 years. This has eliminated the dumping of used oil. Some maintenance may still be performed behind closed doors in the T-hangars, but these facilities have concrete floors and no drains. Therefore, it is unlikely that improper disposal of oils, greases, or solvents is occurring in these buildings.

Any small amounts of material that is dripped or leaked onto the ramp (including the areas of the hangars) that is not cleaned up or does not evaporate, photodegrade, or biodegrade eventually is carried by storm water or snow melt into the ramp drain system. All drainage is routed through four oil/water separators, which receive regular maintenance. Airport personnel report that known discharges, such as small spills that occasionally occur during aircraft refueling, are readily apparent in the oil/water separators. Any unauthorized discharges would be similarly obvious, and would be captured as effectively.

Aircraft engine oil changes are among the services provided by the fixed-base operator. Used oil is collected, stored in closed containers, and combusted in burners to heat the hangars. Used oil also is burned for heating at the interagency helibase.

All storage, use, and disposal is performed consistent with best management practices. This includes, but is not limited, to the following.

- Detergents and hot water preferentially are used by the fixed-base operator for cleaning, and solvents are employed only when detergents are ineffective.
- Solvents are selected based on avoidance of human health and environmental hazards and ozone depletion, the latter in conformance with the U.S. Environmental Protection Agency's Significant New Alternatives Policy (SNAP) Program.
- A parts washer recycling unit allows solvent to be reused several times.
- Spent solvents that are listed as hazardous waste are drummed and shipped offsite by a commercial service, where they are handled in conformance with Resource Conservation and Recovery Act (RCRA) requirements for recycling and/or disposal.

Automobile engine oil changes are performed at the car rental facility, and the used oil is transported offsite by a commercial service to a recycling facility. The hauler and recycler conform with the U.S. Environmental Protection Agency's standards for the management of used oil in Title 40, Part 279 of the *Code of Federal Regulations*. The car rental facility septic tank and two downgradient monitoring wells are tested for volatile and semi-volatile organic hydrocarbons and the results are reported annually to the Wyoming Department of Environmental Quality. Sampling results consistently are below the detection limits for the heavy metals cadmium, chromium, and lead; and are below detection limits for the suite of 67 volatile and semi-volatile organic hydrocarbons that are tested in accordance with U.S. Environmental Protection Agency Method 8260.

Best management practices for all ignitable chemicals are included in the annual Federal Aviation Administration inspection of the airport. Beyond that, the staff of the fixed-base operator, car rental companies, and Jackson Hole Airport recognize the environmental responsibilities associated with operating an airport within a national park and, individually and collectively, take measures to ensure that chemicals used at the airport do not degrade the resources within or outside the airport boundary.

Domestic Wastewater and Wash Water Management

Four septic tank and leach field systems treat domestic wastewater and the wash water from the car wash at the car rental facility.

- Domestic wastewater from the terminal and most other buildings in the development subzone is treated in a system south of the T-hangars close to the east boundary of the airport. This system includes two 10,000-gallon septic tanks and two leach fields. Effluent discharge is regularly rotated between the two leach fields to ensure that neither becomes saturated.

  Restaurant workers in the terminal receive training on the correct disposal of cooking oils and greases and the importance of not discarding these substances into drains. A grease trap that is regularly maintained prevents improperly disposed oils and greases from entering the septic system.

- A separate septic system, installed in 1999, services the car washing facility. The discharge permit for this facility stipulates that "No detergents, solvents, or additives are to be used in the car wash except biodegradable soaps and no washing of engine components is allowed." Most of the water that is used in the car wash is captured, filtered, and reused. The septic tank and two downgradient monitoring wells are tested regularly to ensure that pollutants are not entering the ground water system.
- A septic tank and leach field receives wastewater from the toilet and sink in one of the hangars. This building is on its own system because it is downgradient from the septic system that serves the terminal and most other buildings. A monitoring well downgradient from the hangar septic system provides assurance that improper dumping of chemicals such as oils or solvents is not occurring into this system. This well also provides effective monitoring of ground water for the entire development subzone.
- A septic tank and leach field was installed at the tower to treat the sanitary wastewater produced by the occupants of this facility. Because of the low volumes of waste entering this system, this septic tank is pumped out only once per year. All of the other septic tanks are pumped two or three times annually.

WILDLIFE AND THEIR HABITATS, INCLUDING SPECIAL CONCERN, THREATENED, AND ENDANGERED SPECIES

GENERAL WILDLIFE AND HABITATS

Grand Teton National Park provides habitat for 61 species of mammals, 4 species of reptiles, 6 species of amphibians, 19 species of fish, and 299 species of birds (NPS 2000a). Among the most popular for wildlife viewing by visitors are its six native ungulate species, which include elk, moose, mule deer, bison, pronghorn, and bighorn sheep.

The 533 acres of the Jackson Hole Airport are in an area of predominantly sagebrush steppe on the valley floor east of the Snake River. Within the airport boundary, the developed areas occupy 28.5 acres, and about 100 acres are overlain by runways, taxiways, and other impervious surfaces. The remaining 400 acres are vegetated by sagebrush and antelope bitterbrush with an understory of grasses and forbs. Outside the airport perimeter fence, similar sagebrush steppe habitat is used by birds, mammals, reptiles, amphibians, and invertebrates such as insects.

The Snake River and Gros Ventre River corridors are near the airport and aircraft flight paths. North of the airport, landing and departing aircraft fly at low elevations over the braided channel of the Snake River. Some aircraft that arrive from or depart to the south overfly the Gros Ventre River riparian corridor in the park. Many wildlife species use these river-related habitats, where there is plentiful water and diverse, abundant vegetation for food and cover. River otters, beavers, and muskrats inhabit the river corridors, and the corridors are regularly used by large mammals, such as elk, bison, moose, deer, and pronghorn, for foraging and migration. The corridors in the airport vicinity also provide state-designated critical winter range for moose.

Riparian habitats also are important for many species of migratory and resident birds, and for most of the eight species of bats that occur in the park. Braided, large-river habitat like that occurring in the Snake and Gros Ventre corridors has the highest bird species richness and abundance in the park (Hansen *et al.* 2002). These habitats are especially important for birds judged most at risk in the greater Yellowstone ecosystem (Hansen *et al.* 1999). They are a rare and vital component of the greater Yellowstone ecosystem, representing less than 1% of the total area (Parmenter *et al.* 2003, Powell and Hansen 2007). River corridors are becoming increasingly crucial ecological resources for the region, because they are disproportionately affected by development outside the national parks and forests (Gude *et al.* 2007).

The Gros Ventre and Snake River riparian corridors also serve as important wildlife movement and migration areas. Large mammals, particularly elk, seasonally migrate along the Snake River corridor and broad areas adjacent to it between summer and winter ranges. The airport site formerly was part of this migration corridor. However, since development of the area began in the 1930s, most elk have tended to avoid the airport. In the 1990s, an 8-foot-high, chain-link perimeter fence that is effective in keeping out all larger mammals was constructed. Because the migration corridor is more than 5 miles wide in the airport vicinity, and because U.S. Highway 26/89/191 is the only other major development in this part of the migration corridor, the fenced airport has not adversely affected elk population migrations.

Despite the fence, birds and small mammals enter the airport site regularly. Rodents are abundant and include Uinta ground squirrels, mice, voles, shrews, chipmunks, and northern pocket gophers.

Larger mammals found within the perimeter fence include coyotes, badgers, long-tailed weasels, short-tailed weasels, red foxes, skunks, and raccoons.

The only aquatic feature in the airport boundary is the Enterprise Canal, an irrigation ditch that crosses the airport south of the runway and flows intermittently, typically from May through September. This canal probably supports a seasonal aquatic insect community, serves as a pathway for transient beaver or otter, and provides drinking water for resident mammals and birds.

MIGRATORY BIRDS

Most birds in the airport's sagebrush-dominated community are protected by the Migratory Bird Treaty Act, 16 *United States Code* 703. This act protects migratory birds, their parts, and nests or eggs from taking except as permitted. The U.S. Fish and Wildlife Service, responding to scoping for this project, recognized the presence of migratory birds and raptors within the project area (Kelly 2005).

Migratory birds include raptors, songbirds, and shorebirds that breed in North America but migrate to Mexico, Central America, or South America for the winter. In Wyoming, 162 bird species are considered neotropical migrants (Cerovski *et al.* 2001). Peak migration periods occur in May and then from September through early October. Nesting typically occurs from late May through July.

Migratory birds are of concern to wildlife managers because they have been experiencing severe population declines throughout North American (Askins *et al.* 1990). Habitat fragmentation and habitat loss are among the factors causing these declines (Hutto 1988, Robbins *et al.* 1989). Some migratory birds are also considered birds of special concern by the Wyoming Game and Fish Department because of their population status and need for conservation (see "Special-Concern Species," below).

Studies have not been conducted on the airport property to inventory the occurrence or relative abundance of migratory birds. However, migratory bird species expected to be present include, but are not limited to, savannah sparrow, Brewer's sparrow, vesper sparrow, green-tailed towhee, mountain bluebird, horned lark, western meadowlark, American robin, sage thrasher, Brewer's blackbird, common nighthawk, mourning dove, tree swallow, cliff swallow, and common raven.

The airport was constructed predominantly in sagebrush steppe, although other disturbed zones and small clusters of deciduous trees are present along the south and east edges of the area. Sagebrush-dominated communities are widespread in the park and tend to be co-dominant, and often intermixed, with antelope bitterbrush, with an understory of grasses and forbs. Multiple breeding bird surveys conducted in sagebrush-dominated communities in the park inventoried a total of 20 species, with an average of slightly more than seven species per count site (Wolff 2006b).

The airport may attract many other migratory bird species. Because the perimeter fence protects the vegetation from native grazers and browsers, areas within the fence may support somewhat higher numbers of birds that associate with older-growth sagebrush. Species that capture insects in flight commonly use the fence for perching and foraging. Grassland songbirds that tend to flock in open spaces may use the airport pavements. Swallows and other birds that place nests under eaves or in sheltered crevices may nest on or around the airport buildings.

Raptor use of airport habitats is relatively low because of the absence of nesting habitat, forest edges that provide foraging areas, or aquatic features. Some perch-hunting species use areas where perches are available. However, the airport has no aboveground electrical power infrastructure or exposed wires that would encourage raptor nesting or intensive hunting activities.

Raptors that use arid shrubland and grassland habitats in the airport vicinity during the summer include the American kestrel, Swainson's hawk, red-tailed hawk, northern harrier, short-eared owl, prairie falcon, and golden eagle. These species principally eat small mammals and birds and sometimes forage within the airport boundary. Rough-legged hawks winter in Wyoming and also may hunt over the airport area.

Nesting habitat for most raptors is lacking within the airport boundary. Ground nesting raptors include short-eared owls and harriers. There is a report of a red-tailed hawk nesting in a small tree south of the runway in 2006 (Crowe 2006).

SPECIAL-CONCERN SPECIES

A Comprehensive Wildlife Conservation Strategy, a collaborative effort developed by the Wyoming Game and Fish Department (2005) and experts throughout Wyoming, identified birds of greatest conservation need. From this statewide list, a park-wide list of special-concern species was prepared by park wildlife biologists (Wolff 2006b). Input on special-concern species was obtained from the U.S. Fish and Wildlife Service (Kelly 2005) and Wyoming Game and Fish Department (Wichers 2006) during scoping, and from comments on the draft environmental impact statement.

Special-concern species that potentially have habitats in the airport area are listed in Table 15. Some of these species were discussed previously under the heading, "Migratory Birds."

The sagebrush vegetation community in the airport vicinity may provide suitable habitat for five species of special concern. Brewer's sparrow and sage thrasher, both sagebrush obligates, occur throughout Wyoming, including in Grand Teton National Park. Both depend on sagebrush habitats for breeding and nesting. Population declines of both species have been observed throughout their range due to habitat loss.

The northern sagebrush lizard is the only lizard known to occur in the greater Yellowstone ecosystem. Although not often found above 6,000 feet above mean sea level in the northern Rocky Mountains, it has been documented as high as 8,300 feet elevation in Yellowstone and Grand Teton National Parks in geothermally influenced areas and as high as 7,000 feet in non-geothermal areas. Occurrence of sagebrush lizards in Grand Teton National Park was confirmed in 1992 when an individual was observed near Pilgrim Creek (Koch and Peterson 1995). This species likely occurs only in small, localized areas, and has not been reported in the airport boundary.

Mammalian special-concern species that could occur at the airport include the Uinta ground squirrel, vagrant shrew, and six species of bats. Five of the bats that may occur near the airport are known gleaners (insect eaters) and, listed in approximate decreasing order of gleaning specialization, include the Townsend's big-eared bat, long-eared myotis, fringe-tailed bat, big brown bat, and little brown bat.

TABLE 15: SPECIES OF SPECIAL CONCERN WITH POTENTIAL HABITAT NEAR THE JACKSON HOLE AIRPORT

Common Name, *Scientific Name*	Wyoming Game and Fish Department Status [a/]	Potential Habitat near the Jackson Hole Airport
Short-eared owl, *Asio flammeus*	Native species status 4	Sagebrush
Bobolink, *Dolichonyx oryzivorus*	Native species status 4	Sagebrush
Brewer's sparrow, *Spizella breweri*	Native species status 4	Sagebrush
Sage thrasher, *Oreoscoptes montanus*	Native species status 4	Sagebrush
Swainson's hawk, *Buteo swainsoni*	Native species status 4	Sagebrush
Northern sagebrush lizard, *Sceloporus graciosus graciosus*	Native species status 4	Sagebrush
Vagrant shrew, *Sorex vagrans*	Native species status 3	Forests, sagebrush, riparian
Long-eared myotis, *Myotis evotis*	Native species status 2	Forests, buildings, caves
Little brown myotis, *Myotis lucifugus*	Native species status 3	Forests, buildings, caves
Long-legged myotis, *Myotis volans*	Native species status 2	Forests, buildings, caves
Big brown bat, *Eptesicus fuscus*	Native species status 3	Forests, buildings, caves
Townsend's big-eared bat, *Corynorhinus townsendii*	Native species status 2	Forests, buildings, caves
Western small-footed myotis, *Myotis ciliolabrum*	Native species status 3	Forests, buildings, caves

a/ Concern categories are from Cerovski 2003.

Native species status 2 includes species where (1) populations are declining, extirpation appears possible; habitat is restricted or vulnerable but no recent or on-going significant loss; species may be sensitive to human disturbance; ~OR~ (2) populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; ongoing significant loss of habitat.

Native species status 3 includes species where (1) populations are greatly restricted or declining, extirpation appears possible; habitat is not restricted, vulnerable but no loss; species is not sensitive to human disturbance; ~OR~ (2) populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is restricted or vulnerable but no recent or on-going significant loss; species may be sensitive to human disturbance; ~OR~ (3) Species is widely distributed; population status or trends are unknown but are suspected to be stable; on-going significant loss of habitat.

Native species status 4 includes species where (1) populations are greatly restricted or declining, extirpation appears possible; habitat is stable and not restricted; ~OR~ (2) populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is not restricted, vulnerable but no loss; species is not sensitive to human disturbance; ~OR~ (3) species is widely distributed, population status or trends are unknown but are suspected to be stable; habitat is restricted or vulnerable but no recent or on-going significant loss; species may be sensitive to human disturbance; ~OR~ (4) populations are stable or increasing and not restricted in numbers and/or distribution; ongoing significant loss of habitat.

THREATENED, ENDANGERED, AND CANDIDATE SPECIES

Table 16 presents the species that the U.S. Fish and Wildlife Service identified as listed under the Endangered Species Act of 1973, as amended, as potentially present in the vicinity of the Jackson Hole Airport in Grand Teton National Park (Kelly 2005). In March 2010, the U.S. Fish and Wildlife Service determined that the greater sage-grouse warrants listing under the Endangered Species Act, but was not listed because of higher priority listing actions. Thus, the greater sage-grouse is considered a candidate species for listing under the Endangered Species Act and is included within this section.

No proposed species are present in the park. The formerly threatened bald eagle was removed from the list of endangered or threatened species protected under the Endangered Species Act in 2007.

TABLE 16: FEDERALLY LISTED THREATENED, ENDANGERED, OR CANDIDATE WILDLIFE SPECIES OCCURRING OR POTENTIALLY OCCURRING IN GRAND TETON NATIONAL PARK [a/]

Common Name, *Scientific Name*	**Federal Status**	**Habitat Affinity**
Black-footed ferret, *Mustela nigripes*	Endangered	Prairie dog colonies
Canada lynx, *Lynx canadensis*	Threatened	Montane forests, forest mosaics
Gray wolf, *Canis lupus*	Experimental / non-essential; population	Varies throughout greater Yellowstone area
Grizzly bear, *Ursus arctos horribilis*	Threatened	Montane forests
Greater sage-grouse, *Centrocercus urophasianus*	Candidate	Sagebrush

a/ Source: Kelly 2005 and U.S. Fish and Wildlife Service 2010.

Threatened or Endangered Species

Black-Footed Ferret. The black-footed ferret, listed as endangered by the U.S. Fish and Wildlife Service in 1967, is a member of the weasel family. Ferrets occupy underground burrows excavated by prairie dogs (*Cynomys* spp.). Black-footed ferrets have been extirpated across most of their historic range, primarily as a result of prairie dog eradication. It is estimated that 100 to 150 acres of occupied prairie dog habitat are required to sustain a ferret (NatureServe 2006). Prairie dog colonies are not present in the park or in the project area (Cerovski *et al.* 2004), and there are no historical records of black-footed ferrets in Jackson Hole.

Canada Lynx. The Canada lynx was listed as threatened under the Endangered Species Act in April 2000. The U.S. Fish and Wildlife Service determined the lynx population in the lower 48 states was at risk as a result of human alteration and fragmentation of montane and boreal forests, low numbers as a result of past exploitation, inter-specific competition for prey with bobcats and coyotes, and elevated levels of human access to their habitat. There is no federally designated critical habitat for this species in Grand Teton National Park.

The historic range of Canada lynx included the greater Yellowstone ecosystem. In Wyoming, the Canada lynx has been protected as a nongame species, with no open trapping season since 1973. It is rare in the state (Ruediger *et al.* 2000) and is classified as a Native Species Status 1-Species of Special Concern by the Wyoming Game and Fish Department (2005). This designation indicates that habitat is declining or vulnerable and populations are physically isolated or at extremely low densities.

Lynx management areas, called lynx analysis units, have been identified in Grand Teton National Park (Ruediger *et al.* 2000). Mapping of lynx analysis units in the park was based primarily on vegetative characteristics. Five areas totaling about 150,000 acres include 96,000 acres of potential lynx habitat. None of these areas include the airport or its immediate vicinity.

Historical locations of lynx have been documented within Grand Teton National Park (Reeve *et al.* 1986, McKelvey 2000). More recent sightings and DNA detections have confirmed the continued occurrence of lynx in and adjacent to the park (Squires and Laurion 2000, Squires and Oakleaf 2005, Murphy *et al.* 2006, Holmes and Berg 2009, Berg 2010). During the winter of 2007/2008, researchers documented lynx tracks in the Arizona Creek drainage near the park (Berg 2010) and in the Colter Bay area (Patla 2010). Lynx tracks were detected on 10 occasions in winter of 2008/2009 in the Togwotee Pass area (Holmes and Berg 2009). This included a location just south of the park boundary in the Spread Creek drainage. Radio-collared lynx from Colorado have also been documented passing through the Teton Range and in the Togwotee Pass area. It is unknown whether the recently detected lynx are residents or transients.

Based on the low density of lynx in Jackson Hole and the lack of suitable prey or habitat in the airport's vicinity, Canada lynx are not expected to occur within or adjacent to the airport.

Gray Wolf. The northern Rocky Mountain wolf was initially listed as endangered in 1973 (38 *Federal Register* 14678). In 1995, wolves were reintroduced to the greater Yellowstone area. This reintroduced population was designated an experimental non-essential population under section 10(j) of the Endangered Species Act. No critical habitat was designated for this population. In 2009, the U.S. Fish and Wildlife Service defined this population as the Northern Rocky Mountain Distinct Population Segment and removed it from the endangered species list in eastern Washington, and Oregon, north-central Utah, and Montana and Idaho. However, this distinct population segment remains listed as threatened within the state of Wyoming, including Grand Teton National Park.

Wolf distribution varies depending on prey abundance. A variety of habitats and vegetation cover types are used. The most important habitat attributes for wolves include an adequate ungulate prey base and tolerance by humans (Jimenez 2001). In some areas, small mammals provide an important source of food during non-winter months. All of Grand Teton National Park serves as suitable habitat for gray wolves.

Currently, there are at least five wolf packs with territories that include portions of Grand Teton National Park. The Phantom Springs, Pacific Creek, Buffalo, Antelope, and Pinnacle Peak packs have overlapping ranges covering a significant portion of the park from the base of the Tetons eastward. There are two wolf packs (Antelope and Pinnacle Peak) with home ranges directly adjacent to the Jackson Hole Airport. However, the perimeter fence surrounding the airport is effective in excluding wolves and most of their prey.

Wolves are known to plunge through snow to capture rodents and other small mammals. Aircraft noise could affect this mode of prey capture, because success depends on detecting and localizing very faint sounds. However, snow plunging is one of several foraging strategies employed by wolves, and other modes of foraging may not be as affected by noise.

Occurrence of wolves in the vicinity of the airport is incidental and uncommon. Therefore this species is not likely to be present in the project area and would not be affected by either alternative.

Grizzly Bear. Grizzly bears once roamed much of the western United States, but were extirpated from much of their historic range by the middle of the 20th century (U.S. Fish and Wildlife Service 1993). A small population persisted in Yellowstone National Park. Grizzlies were listed as threatened under the Endangered Species Act in 1975, and a recovery plan was developed and recovery zone delineated (U.S. Fish and Wildlife Service 1982, 1993). In 2003, a conservation strategy for the Yellowstone grizzly bear was finalized (U.S. Fish and Wildlife Service 2003). This document specified grizzly bear management conservation parameters for a primary conservation area (equivalent to the recovery zone under earlier recovery plans). It was in effect from March 2007 to September 2009 while grizzly bears were temporarily delisted, in conjunction with state plans that directed management of the bear in Wyoming, Idaho, and Montana outside the national parks. As a result of litigation, Yellowstone ecosystem grizzly bears were placed back on the endangered species list in September 2009.

There currently are six recovery zones in the United States, one of which, the Yellowstone recovery area, includes a portion of the greater Yellowstone area and encompasses Yellowstone National Park and parts of Grand Teton National Park and the John D. Rockefeller, Jr. Memorial Parkway. The following demographic recovery goals are outlined in the recovery plan (U.S. Fish and Wildlife Service 1993):

- Fifteen unduplicated females with cubs over a running 6-year average inside the recovery zone and within a 10-mile area immediately surrounding it;
- Sixteen of 18 bear management units occupied by females with young from a running 6-year sum of verified sightings and evidence; in addition, no two adjacent bear management units shall be unoccupied;
- Known human-caused mortality not to exceed 4% of the minimum population estimate based on a 6-year running average; and
- Total known, human-caused female mortality cannot exceed 30% of this 4% over the most recent 6-year period. These mortality limits cannot be exceeded during any two consecutive years for recovery to be achieved.

General Ecology and Conservation Concerns. Grizzly bears occupy a variety of coniferous forest and rangeland habitats. They are a wide-ranging species that requires adequate space and isolation from humans, suitable den sites, and an adequate food base. Grizzlies are opportunistic feeders, consuming both carrion and vegetal matter, such as bulbs and tubers. Plant matter may be an important diet component in spring and summer and bears may forage in riparian areas, avalanche chutes, and big game winter ranges. Bears also feed on ungulate calves during the spring calving seasons. In summer and fall, they move to higher elevations and shift their diet to fruits and whitebark pine nuts (U.S. Fish and Wildlife Service 1993).

Grizzly bear management within Grand Teton National Park is governed by the park's human-bear management plan (NPS 1989) and the Interagency Grizzly Bear Guidelines (Interagency Grizzly Bear Committee 1986, referred to as the "Guidelines"). The Guidelines were developed in an effort to provide effective direction for the conservation of grizzly bears and their habitat among the federal agencies responsible for managing land within the recovery zone. They were submitted to the U.S. Fish and Wildlife Service for formal consultation as required by 50 *Code of Federal Regulations,* section 402.04, which resulted in a biological opinion that stated "It is our opinion that implementation of the Guidelines will promote conservation of the grizzly bear." The Interagency Grizzly Bear Committee subsequently approved the application of the Guidelines on federal lands throughout grizzly bear ecosystems in Idaho, Montana, and Wyoming. Specifically, the park's objectives for managing grizzly bears are to:

- Restore and maintain the natural integrity, distribution, and behavior of grizzly bears.
- Provide for visitors to understand, observe, and appreciate grizzly bears.
- Provide for visitor safety by minimizing bear/human conflicts, by reducing human-generated food sources, and by regulating visitor distribution.

Management of grizzly bears in Grand Teton National Park under these programs has been highly successful in promoting grizzly bear recovery and reducing bear-human conflicts and human-caused bear mortalities.

Likelihood of Occurrence in the Project Area. Grizzly bears have increased from relatively uncommon to common in Grand Teton National Park during the last 20 years, in conjunction with a steady trend toward increasing bear density in the southern greater Yellowstone area (Schwartz *et al.* 2002, Pyare *et al.* 2004). Grizzly bears are now common in the Gros Ventre Mountains on the southeastern border of Grand Teton National Park, and southeast to the upper Green River basin. Grizzlies can also now be found throughout the Teton Range, but they are most often sighted north of Leigh Canyon and the Badger Creek drainage, where visitor use of the backcountry occurs at relatively low levels. On the Jackson Hole valley floor, they are common from Jenny Lake and north, and in recent years have been observed many times near park headquarters at Moose, along the Moose-Wilson Road corridor, and around Blacktail Butte.

It is possible that one or more grizzlies have traveled through areas adjacent to the airport, but they are not common residents. The generally poor bear habitat, lack of calving elk, and high level of development in these areas are not attractive for bears. The fence around the airport is effective at excluding bears from the 533-acre property.

Candidate Species: Greater Sage-Grouse

Greater sage-grouse populations across the species' entire North American range have been in decline for nearly 20 years. These declines have resulted in the petitioning for listing under the Endangered Species Act of some subspecies and distinct population segments. In 2005, The U.S. Fish and Wildlife Service determined that listing the greater sage-grouse as threatened or endangered was unwarranted (70 *Federal Register* 2244, February 12, 2005). However a December 4, 2007 ruling by the U.S. District Court for the District of Idaho directed the U.S. Fish and Wildlife Service to reconsider its decision. On March 5, 2010, the U.S. Fish and Wildlife Service (2010) determined that the greater sage-grouse warrants listing under the Endangered Species Act, but is precluded because of higher-priority listing actions. Thus, the greater sage-grouse is considered a candidate species for listing under the Endangered Species Act. Candidate species do not have legal protection under the Endangered Species Act and, thus, are not subject to section 7 consultation pursuant to the act.

On March 8, 2010, the National Park Service contacted the U.S. Fish and Wildlife Service to request additional information and conservation recommendations for inclusion into this final environmental impact statement. Some of these recommendations have been included at the end of this section for reference purposes.

Greater sage-grouse are year-round residents of Wyoming, and numbers of breeding sage-grouse were estimated in excess of 20,000 in 1998 (Braun 1998). However, their populations throughout the West, including Wyoming, have experienced an average 33% decline since 1985 (Braun 1998). This species is listed as a Level 1 Priority Species in the Wyoming Bird Conservation Plan, suggesting that sage-grouse statewide require applied conservation action (Cerovski *et al.* 2001). In response to these concerns, the Wyoming Game and Fish Department (2003) prepared the Wyoming Greater Sage-Grouse Conservation Plan. In addition, the State of Wyoming has adopted a greater sage-grouse "Core Population Area Strategy," Executive Order 2008-2, to ensure greater sage-grouse conservation. The recommendations of the state sage-grouse implementation team and core population area strategy state that development of any type in the most important sage-grouse habitats (core areas and associated seasonal habitats) is to take place only when no decline to the species can be demonstrated. The strategy further states the burden of proof for showing development does not affect sage-grouse rests with the industry or proponent in question, and any research they feel is necessary to convey this, should be conducted outside core areas. The Jackson Hole Airport is located in an area designated by the State of Wyoming as a core sage-grouse population area.

Sage-grouse populations in Jackson Hole are considered to be remnant and at risk of extirpation (McDonald 2006). This local population, as measured by male and female attendance on leks (see glossary in Chapter 6 for definition), has declined by more than 70% in some years since 1990 (Wolff 2006a), compared to an approximate decline of 30% elsewhere in Wyoming. The local population reached a low in 1999, when 47 male sage-grouse were counted. Since then, the number of males counted at leks has increased, reaching 149 in 2006 (Hatch 2007b). Based on unpublished data, more than 400 sage-grouse (males and females) were counted during a winter 2007-2008 survey conducted by Beringia South, a local non-profit research and education institute. Some of the birds tallied in the winter reside in the Gros Ventre hills and are not counted during springtime lek surveys.

Reasons for the population changes are being investigated both on the Jackson Hole Airport and in surrounding valley areas. The Jackson Hole Airport Board contributed about $30,000 in October 2007 to support sage-grouse population and habitat investigations (Hatch 2007a). The state of Wyoming is supporting a local sage-grouse research project conducted by Beringia South, which is also sponsored by the Upper Snake River Sage-Grouse Working Group.

The causes of previous sage-grouse population declines and the recent population increase in Jackson Hole remain largely unknown. Suspected factors for their decline include permanent loss, degradation, fragmentation, and other changes of key habitats, as well as low nest productivity. Any substantial changes to the existing suitable habitat or survival rates of sage-grouse may seriously imperil the continued existence of the Jackson Hole population (McDonald 2006). Recent research by Dr. Gail Patricelli of the University of California, Davis in the Pinedale region of Wyoming has demonstrated that low-frequency noise can cause substantial declines in lek attendance (Blickley *et al.* 2008). The apparent increase in males at leks may be at least partially a reflection of increased survey effort as well as the discovery of two new leks in the park.

Sage-grouse in the Jackson Hole region, including the airport, belong to a resident, non-migratory population (Holloran and Anderson 2004). Sage-grouse research has confirmed the presence of this species within the airport boundary fence throughout the year, including during reproductive, brood-rearing, and wintering phases of the annual life-cycle (Holloran and Anderson 2004, Wolff 2005, Federal Aviation Administration 2006d, Hatch 2007b).

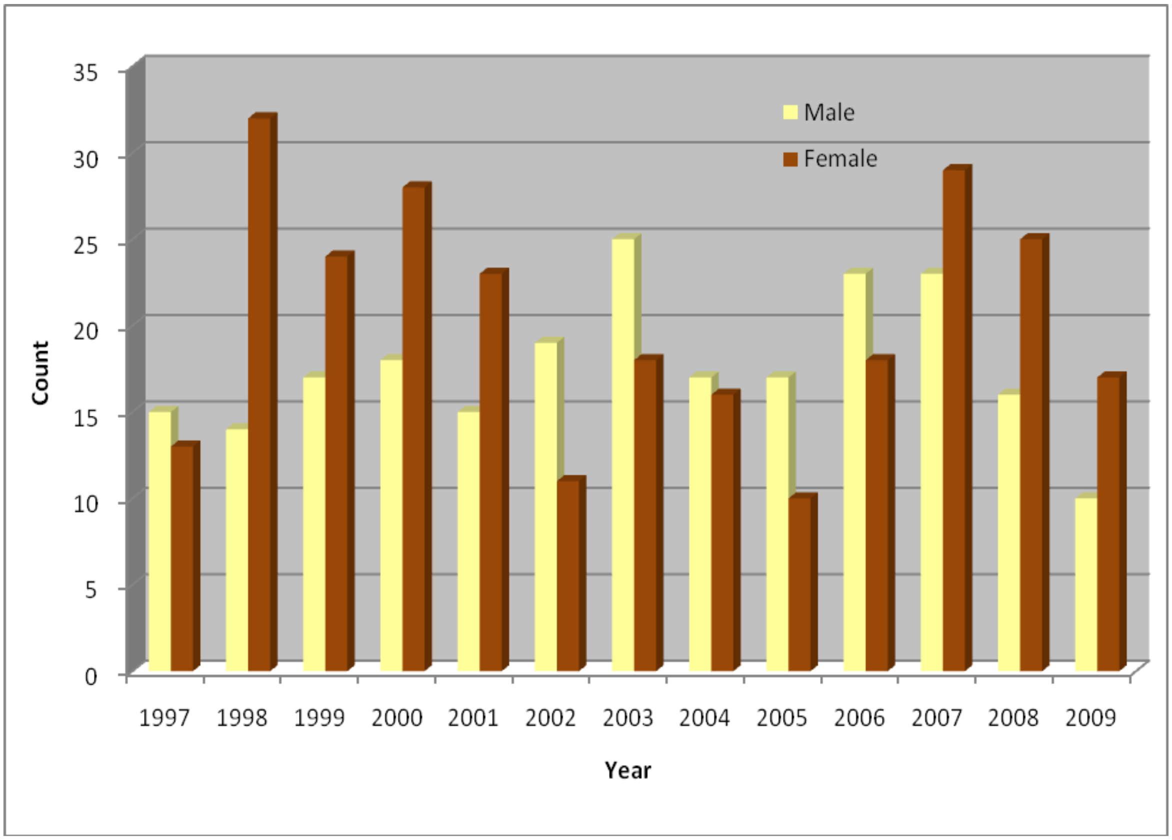
Nine historical greater sage-grouse leks are known to occur within the eastern and southern portions of the park. However, in recent years, sage-grouse used only three of these, including the Moulton, Jackson Hole Airport, and Timbered Island leks.

Over the past decade, an annual average of about 18 males and 19 females has been recorded at the airport lek, with actual numbers shown in Figure 9. This lek is north and west of the runway adjacent to a sagebrush area. Male attendance at the airport lek inside the fenced area has been recorded intermittently since 1948, when more than 60 males were regularly observed (Wolff 2005). This lek experienced the second highest mean attendance rate of known leks throughout the occupied habitat north of Jackson during a 10-year period, and is considered important to this segment of the local sage-grouse population. However, the number of males at the airport lek declined over the last 10 years and remains below average (Wolff 2006c).

In 2006, a satellite lek was located about a half-mile east of the airport, where a small number of grouse were counted sporadically. Birds were observed inconsistently strutting there during 2007 to 2010 lek counts (Wolff 2006c, 2007, 2010).

No sage-grouse nests have been recorded within the airport perimeter fence. However, one recorded nest attempt was within 300 feet of the northwest corner of the airport area.

FIGURE 9: JACKSON HOLE AIRPORT LEK
ANNUAL MAXIMUM GREATER SAGE-GROUSE COUNTS, 1997-2009
Source: Grand Teton National Park



Early brood-rearing hens in the Jackson Hole region remain within about 0.6 miles of their nests. Based on the incidence of nesting near the airport and frequency of reported flocks of sage-grouse along the runway and taxiways during brooding and summer months, sage-grouse apparently use habitats within the airport boundary as early and late brood-rearing habitat. Federal Aviation Administration records include numerous reports of sage-grouse through mid- and late summer, and these observation likely involve hens with and without broods, as well as males (Federal Aviation Administration 2006d).

Five winter locations within the airport boundary were confirmed between 1999 and 2003 by radio telemetry (Holloran and Anderson 2004). Recent unpublished information gathered by Beringia South also confirmed that grouse occupy the airport in winter months.

Habitat requirements for sage-grouse change somewhat during the breeding, nesting, brood-rearing, and wintering periods. However, throughout the year, sage-grouse require large expanses of sagebrush habitats containing a diverse, substantial understory of native grasses and forbs that provide food and cover. Sage-grouse use a variety of vegetation conditions and communities in the fall, including sagebrush, meadows, and recently burned areas. Recent studies have identified the north end of the National Elk Refuge, the sagebrush flats around Kelly, an area south of Blacktail Butte, and Wolff Ridge as important winter range (Holloran 2002).

Sage-grouse have a high fidelity to seasonal ranges and return to historical lek and nest sites year after year (Fischer *et al.* 1993). Breeding activity begins in mid-March when grouse gather on leks in open areas, low sagebrush zones, ridgetops, and old lakebeds surrounded by denser sagebrush cover (Connelly *et al*. 1981). Breeding and lek attendance at the airport have been observed into late May during some years.

After breeding is completed, females disperse to nesting areas characterized by relatively dense, tall, mature sagebrush stands (Connelly *et al*. 2000, Holloran and Anderson 2004). Nests are typically shallow depressions lined with grass, twigs, and feathers under the tallest shrub in the given sagebrush stand (Keister and Willis 1986). Most nests occur within 2 to 4 miles of the lek, but some nests can be more than 12 miles away (Autenrieth 1981, Wakkinen *et al*. 1992). Sage-grouse nests in the park are, on average, 2.8 miles (range 1.4 to 6.2 miles) from active leks (Holloran and Anderson 2004) and are located throughout Antelope Flats, Ditch Creek, Baseline Flats, the Potholes, and north of the airport. Known brood-rearing locations in the park include Antelope Flats, Baseline Flats, the area north of the airport, within the airport fence, and the area southwest of Lost Creek Ranch.

Some researchers describe winter habitat as the most limiting seasonal habitat (Patterson 1952, Eng and Schladweiler 1972, Beck 1977), and perhaps the most critical (Remington and Braun 1985). Winter habitat exists within the project area, as determined from radio-telemetry data collected between 1999 and 2003 (Holloran and Anderson 2004) and from unpublished locations recorded by Beringia South in the winter of 2007-2008. Sage-grouse select dense, tall stands of mature sagebrush during the winter where they find both food and cover. They also use low sagebrush stands on open, windswept knolls as feeding sites. Sage-grouse are widely dispersed over wintering areas during mild weather, but concentrate in areas with exposed sagebrush as snow depth increases. Major wintering concentration areas in the park include relatively flat south- to west-facing slopes in areas south of Blacktail Butte and on Wolf Ridge, exposed sagebrush near Lost Creek Ranch, the Potholes, and areas near the town of Kelly and Teton Science School (Holloran and Anderson 2004) and Spread Creek.

The U.S. Fish and Wildlife Service, Wyoming Game and Fish Department, and Upper Snake River Basin Sage-Grouse Working Group each identified sage-grouse concerns during scoping. They:

- Recognized the decline in the local population and the importance of the airport lek to local population persistence.
- Noted that concerns persist for sage-grouse population status, trends, and threats.
- Expressed concern that airport operations may impact sage-grouse, and suggested limiting disturbance of sage-grouse habitats during breeding activities at the airport lek, and during nesting, and brood-rearing phases of the annual cycle (March–August)
- Recommended not hazing birds at the airport, as it could cause birds to fly and become a hazard, and it could disrupt lek activity.
- Recommended that activities that may exacerbate habitat loss or degradation should be avoided, and that measures should be implemented to reduce the potential of all bird and aircraft collisions.

Neither the Wyoming Game and Fish Department nor the U.S. Fish and Wildlife Service provided sage-grouse comments for the draft environmental impact statement. However, in a letter dated April 7, 2010, the U.S. Fish and Wildlife Service provided additional conservation recommendations and information regarding sage-grouse populations. Two of these recommendations are reproduced below. A copy of the complete letter from U.S. Fish and Wildlife Service can be found in Appendix A.

- "If important breeding habitat (leks, nesting or brood rearing habitat) is present in the project area, the Service recommends no project-related disturbance March 15 through June 30, annually. Minimization of disturbance during lek activity, nesting, and brood rearing is critical to sage-grouse persistence within these areas. Likewise, if important winter habitats are present, we recommend no project-related disturbance November 15 through March 14."
- "The Service recommends surveys and mapping of important greater sage-grouse habitats where local information is not available. The results of these surveys should be used in project planning to minimize potential impacts to this species. No project activities that may exacerbate habitat loss or degradation should be permitted in important habitats."

COLLISIONS BETWEEN AIRCRAFT AND BIRDS

Wildlife strikes by aircraft are a hazard to human safety, equipment, and wildlife at all airport facilities. As directed under a memorandum of agreement, signatory federal agencies are coordinating efforts to address current and future environmental conditions leading to such strikes (Cleary and Dolbeer 2005). The memorandum of agreement is intended to improve the internal management of the federal agencies to address conflicts between aviation safety and wildlife.

Airport sponsors and managers are required to ensure that each airport facility maintains a safe operating environment. Because of past wildlife strikes at the Jackson Hole Airport, an assessment of the risk and magnitude of the wildlife strike problem is underway through the Wildlife Services Division of the U.S. Department of Agriculture in accordance with Title 14, *Code of Federal Regulations*, Part 139.337. Approximately half of all reported aircraft strikes at the Jackson Hole Airport apparently involved migratory birds. This is consistent with national patterns characterized by Dolbeer's (2006) analysis of the incident records in the Federal Aviation Administration's National Wildlife Strike Database for Civil Aviation, 1990-2004.

The Federal Aviation Administration estimates that, nationwide, nearly 80% of collisions between wildlife and aircraft go unreported. This suggests that the occurrence of such collisions at the Jackson Hole Airport is higher than the total in the Federal Aviation Administration's National Wildlife Strike Database. Data from this source show that in the 12 years from 1994-2005, 24 bird strikes were reported for the Jackson Hole Airport. Four bird strikes caused substantial damage to aircraft. Eight of the incidents (33%), all of which occurred in March, June, or July, likely involved sage-grouse (Federal Aviation Administration 2006d).

There are no records in the Wildlife Strike Database of collisions with animals other than birds at the Jackson Hole Airport. Airport operations include written procedures for perimeter checks, which are accomplished every three hours. These procedures include wildlife monitoring and regular observation to ensure that large wildlife species are not within the perimeter fence, and that smaller species that are not stopped by a fence, such as raptors and coyotes, are not near the runway (Bishop 2008). In addition, airport tower personnel communicate any danger they observe to ground crews, who then address the problem. On the rare occasions when deer or other large animals are found within the perimeter fence, they are herded out an open gate (Johnstone 2006).

There is no aboveground electrical infrastructure at the airport, or threat of electrocution for birds or other wildlife. Plans for additions or improvements to facilities will continue to be reviewed to ensure that they will not increase the potential for aircraft/wildlife strikes. New structures or facilities will be designed to discourage nesting or roosting of raptors or migratory birds at the airport.

EFFECTS OF SOUNDS FROM AIRPORT OPERATIONS

The wildlife within and adjacent to the airport fence within the sagebrush steppe habitat are exposed daily to sound from numerous aircraft types. Aircraft arriving to the airport from the north, and aircraft departing to the north, fly at low elevation over the Snake River, and part of the aircraft arriving from or departing to the south overfly the Gros Ventre River in the park (see figures G-32 and G-33 in Appendix G). In addition to aircraft sound, wildlife on and near the airport are exposed to daily sound from baggage tugs, snowplows, maintenance trucks, and other equipment associated with airport operations.

Six sound monitors near the airport in the town of Jackson (two sites) and Grand Teton National Park (four sites) have been recording aircraft sound levels since 2004. The closest monitoring site to the airport, the Moulton Loop station, is at Zenith Drive and Spring Gulch Road just south of the runway outside the park. The closest national park site is the Moose station, which is north of the runway and east of the Craig Thomas Discovery and Visitor Center along the Snake River corridor.

Typical daytime ambient sound levels at the Moulton Loop station generally are in the low 50 dBA to the low 60 dBA range. At the Moose station, they typically are in the low to upper 40 dBA range. The Moose station is farther from the runway and aircraft are higher above the ground at this location than at the Moulton Loop station.

The monitoring stations also log and report the maximum sound level (Lmax) for each sound event of aircraft operations. These indicate the maximum exposure of wildlife to aircraft sound, and vary widely, based on factors such as time of year and location. For example:

- July 5, 2006 was representative of a peak-operations day. At the Moulton Loop station, there were 299 reported sound events that ranged from 62.0 to 101.3 dBA. At the Moose station for the same day, there were 46 recorded events that ranged from 63.2 to 82.5 dBA. (The data, which recorded six times more sound events south of the airport than at Moose, also show the effectiveness of the preferred runway procedures that have been implemented by airport managers for sound level reduction.)
- On January 16, 2005, which is during a slower travel time of the year, there were 42 reported sound events from the Moulton Loop station that ranged from 62.1 to 91.3 dBA. On the same day, the Moose station recorded 30 sound events that ranged from 58.2 to 81.7 dBA.

PARK AND AIRPORT OPERATIONS

The Department of the Interior Airports Act was passed on March 18, 1950 and is part of the *United States Code*, Title 16, Chapter 1, Subchapter I. Section 7a of this act, which is included in Appendix B, states that:

> *The Secretary of the Interior is authorized to plan, acquire, establish, construct, enlarge, improve, maintain, equip, operate, regulate, and protect airports in the continental United States in, or in close proximity to, national parks, national monuments, and national recreation areas, when such airports are determined by him to be necessary to the proper performance of the functions of the Department of the Interior.*

The 1983 agreement says:

> *"The Secretary of the Interior has determined that the continued operation of [the Jackson Hole Airport] is necessary to the proper performance and function of the Department and that no feasible and prudent alternatives thereto exist.*

The agreement then defines the terms and conditions under which the Jackson Hole Airport must operate. Key points are summarized in Chapter 1 under "Agreements for the Jackson Hole Airport."

NATIONAL PARK SERVICE OPERATIONS

Coordination with and Oversight of the Jackson Hole Airport Board

The 1983 agreement provides opportunities for the National Park Service, acting on behalf of the Department of the Interior, to function in an oversight role with the Jackson Hole Airport Board. Specifically:

- While the Jackson Hole Airport Board is identified as the operator of the airport, it must consult with the National Park Service on matters that may significantly affect Grand Teton National Park.
- For any proposed improvements, the Jackson Hole Airport Board must notify the National Park Service at the preliminary or conceptual stage, and provide detailed plans and specifications at least 150 days before the start of construction. The National Park Service must provide the Board with its written comments, if any, within 60 days.
- The National Park Service must participate in annual joint inspections with the Board to determine maintenance and repair needs.
- The National Park Service is to receive an annual financial report, and has the right to examine the Board's records to verify reports.
- Coordination with the National Park Service is required to ensure conformance with the National Historic Preservation Act and National Environmental Policy Act. Except within the development subzone, where National Environmental Policy Act compliance requirements were met by the 1983 agreement environmental assessment, both acts apply to all actions at the airport.

These activities result in daily interaction between the airport and the NPS' lead contact, and collectively require about one full-time-equivalent NPS position in a normal year. That value can increase during special circumstances, such as the preparation of this environmental impact statement on extending the agreement. However, even under these conditions, the NPS' coordination and oversight activities represent a small fraction of the labor associated with its employment at the park of almost 200 people in the winter and 300 during the summer season.

Management of the Area around the Jackson Hole Airport

The National Park Service manages the sagebrush flat outside the airport boundary for wildlife and other natural ecological processes. The staff commitment required to implement this management approach in this area would not change with implementation of either alternative.

Transit Business Study

The record of decision for the *Transportation Plan Final Environmental Impact Statement, Grand Teton National Park* (NPS 2006b) was signed in March 2007. A transit business study is currently being finalized that evaluates the feasibility and need for a transit system within Grand Teton National Park. This may have relevance to airport and park operations if a system were to be deemed feasible and necessary. Services could potentially be provided in partnership with another entity, such as the Southern Teton Area Rapid Transit (START).

Interagency Helibase Operations

In 2004, the National Park Service and U.S. Forest Service constructed a permanent, interagency, helibase operations center at the Jackson Hole Airport. Factors contributing to the selection of this site included the availability of utilities infrastructure, absence of commercial or residential buildings that could interfere with flight operations, proximity to primary locations for search and rescue missions, adequate safety clearances, and the compatibility of the proposed facility with existing visual and sound conditions and visitor expectations (NPS 2001b).

The helibase, shown in Figure 3, is north of the terminal, outside the development subzone. The 5-acre site includes an office building, underground fuel storage, parking, security fencing, and three helicopter pads, each with a 90-foot safety circle and the ability to accommodate medium (Type 2) helicopters. Future development could include a 5,000-square-foot aircraft hangar.

The interagency helibase generally has about 240 operations per year (120 takeoffs and 120 landings). Most occur from June through September. Many of these operations include flight time beyond the park boundary.

The helibase water, sewer, and electrical systems are connected to those of the airport. All other functions, such as fuel storage, parking, and site snowplowing, are independent from airport operations (although the agencies benefit from the airport staff's plowing of snow from the access road from U.S. Highway 26/89/191 to the airport). Helibase flight operations are coordinated with the tower, which is operated by the Federal Aviation Administration, during activities such as wildland fire suppression and search and rescue.

Helibase flight operations do not include helicopter medical evacuations. As described under "Public Health and Safety," medical evacuations fly directly from the originating city to the helipad at St. Johns Medical Center.

JACKSON HOLE AIRPORT OPERATIONS

Facilities

Facilities at the Jackson Hole Airport were shown in Figure 3. The asphalt runway, designated 1/19 (indicating a nearly north-south alignment), is 6,300 feet long and 150 feet wide, with 300-foot-long, paved safety areas on each end. The runway is stress-weighted for 300,000 pounds. The north end of the runway is 6,451 feet above mean sea level and the south end is 38 feet lower, at 6,413 feet. The runway is served by a full, parallel, 75-foot-wide taxiway along its east side. The center-to-center separation between the runway and taxiway is 400 feet.

Consistent with the 1983 agreement, improvements west of the runway are limited to navigation and safety aids. These include the airport beacon, segmented circle and wind tee, 50-foot-high air traffic control tower, and very high frequency omnidirectional range (VOR) navigational aid. The VOR is about 1,500 feet north of the end of the runway, slightly to the west of its center line.

In September 2008, the Federal Aviation Administration completed construction of an Federal Aviation Administration's Air Traffic Control Beacon Interrogator-6 (BI-6) aircraft tracking system. Often referred to as a "radar," this aircraft tracking facility provides controllers with information on aircraft within 200 nautical miles of the Jackson Hole Airport. The system includes a tower supporting a rotating radar sail and antenna that, with lightening rods, extends 39 feet above the ground surface. The radio transmitter and electronic equipment is in a 27-foot by 30-foot shelter next to the tower. The facility enhances the safety of flight operations and the efficiency of air traffic control by providing aircraft tracking coverage that was previously not available for aircraft using the Jackson Hole Airport. Currently, the information is provided directly to air traffic controllers in the Salt Lake City Air Route Traffic Control Center. Because the Jackson Hole tower does not have a terminal that displays the information, the controllers rely on visual and verbal information to maintain aircraft separation. A terminal may be installed in the Jackson Hole tower at a later date.

Almost all other airport facilities are within the 28.5-acre development subzone. These include the terminal, aircraft rescue and fire fighting (ARFF) building, rental car facility, hangars, automobile parking lots, fixed-base operator buildings, fuel storage in underground tanks, internal roads, septic tank and leach field systems for wastewater treatment, and most of the aircraft parking area.

All buildings within the development subzone are within the 1983 agreement's requirement that they cannot be "at an elevation height in excess of the existing buildings." The National Park Service and Jackson Hole Airport Board have agreed that this elevation is 6,437 feet above mean sea level.

The interagency helibase is north of the terminal outside the development subzone. This NPS facility is authorized at this location under the July 30, 2003 amendment to the 1983 agreement. In 2005, the aircraft apron was extended to the north by 300 feet and a 20,000-gallon storage facility for concentrated propylene glycol for aircraft deicing was installed north of the terminal behind the helibase.

The Jackson Hole Airport Board has on ongoing program of facilities improvements. Many of the actions taken at the airport over the past 20 years are listed under the heading, "Existing Facilities at the Jackson Hole Airport" in Chapter 1. Improvements that were recommended in the airport master plan environmental assessment (P&D Environmental Services 1997) that could be implemented in the future include:

- Replacement of the Jackson Hole Aviation office and conventional hangar with a single building;
- Removal of two of the northerly Jackson Hole Aviation buildings, and replacement of the T-hangars with a single hangar at the same location;
- An addition to the aircraft rescue and fire fighting (ARFF) building; and
- Addition of a conventional hangar in the area of the Jackson Hole Aviation office.

Enplanements

The data on enplanements (see the glossary for a definition) shown in Table 17 were provided by the Jackson Hole Airport Board (2006c) and Bishop (2009) for the period from 1993 through 2009. Changes from year to year varied widely, with decreases in enplanements between six years and increases between 10 years. Enplanements in 1993 and 2002 were relatively constant, at about 190,000 per year. Since then, enplanements have increased in most years, resulting in a high of nearly 312,000 enplanements in 2008.

TABLE 17: ENPLANEMENTS AT THE JACKSON HOLE AIRPORT, 1993 THROUGH 2009

Year	Number of Enplanements	Percent Change
1993	193,982	--
1994	181,080	-6.6
1995	169,062	-6.6
1996	180,120	+6.5
1997	191,113	+5.7
1998	199,694	+4.5
1999	173,358	-13.2
2000	182,013	+5.0
2001	176,764	-2.9
2002	190,416	+7.7
2003	217,729	+14.3
2004	215,587	-1.0
2005	250,165	+16.0
2006	274,031	+9.5
2007	289,000	+5.5
2008	311,795	+7.9
2009	290,088	-7.0

As was illustrated previously in Figure 7, enplanements show two seasonal peaks:

- The higher peak occurs in July and August, each of which has about 15% to 20% of the annual enplanements per month. Much of this air traffic is associated with summer visitation to the area's national parks.
- The second peak begins in December and continues through March, with each of these months representing about 10% to 12 % of annual enplanements. Most of these people come to the area for winter sports activities, particularly skiing.

- April and November have the lowest numbers of enplanements, with numbers in these months that consistently are about 3% or 4% of annual enplanements. These numbers probably represent the base level of scheduled passenger service air travel that would occur from area residents and from business activity not directly related to the recreation industry.

The development of the two distinct travel seasons at the Jackson Hole Airport occurred after 1970, when the only significant air travel was during the summer months. By 1980, a pronounced winter travel peak was developing, and by 1990, the winter travel level was approaching its current percentages (P&D Environmental Services 1997).

Airport Flight Operations

Currently, 52 aircraft are based at the Jackson Hole Airport. These include 36 single-engine airplanes, 3 multi-engine airplanes, 11 jet airplanes, and 2 gliders (AirNav, LLC 2008).

Table 18 shows aircraft operations (see the glossary for a definition) at the Jackson Hole Airport for the 10-year period from 2000 through 2009. In the period of October 2004 through September 2005, which served as the baseline year for modeling, the airport had a total of 33,005 operations, or an average of about 90 aircraft operations per day. This value is very close to the average over the 10-year period of 33,292 operations per year and is considered a good representation of existing conditions.

TABLE 18: OPERATIONS AT THE JACKSON HOLE AIRPORT, 2000 THROUGH 2009

Year	Air Carrier	Air Taxi [b/]	Itinerant General Aviation	Local General Aviation	Military	Total	Percent Change
2000	1,945	7,605	21,769	4,454	123	35,896	---
2001	2,128	12,413	21,633	4,037	505	40,716	+13.4
2002	1,982	13,094	17,095	3,418	389	35,978	-11.6
2003	3,642	11,180	13,951	4,470	330	33,573	-6.7
2004	2,824	11,575	13,729	3,497	192	31,817	-5.2
2005	3,779	11,033	14,415	3,586	293	33,106	+4.1
2006	5,502	8,766	15,159	2,500	275	32,202	-2.7
2007	5,236	8,790	14,643	1,571	297	30,537	-5.2
2008	6,899	7,279	12,952	2,714	247	30,091	-1.4
2009	6,888	6,486	12,496	2,977	156	29,003	-3.6

a/ Source: Jackson Hole Airport Board (2006c) and Bishop (2009).
b/ Includes both scheduled regional carriers with less than 60 seats and unscheduled charters/fractional ownership with less than 60 seats.

The airport master plan environmental assessment noted that a change was occurring in the type of aircraft using the Jackson Hole Airport. It observed a decrease in single-engine engine aircraft based at the airport and a shift to larger, turbine-powered aircraft (P&D Environmental Services 1997).

In their landings and takeoffs, pilots are requested to minimize aircraft sound over the noise-sensitive portions of the park, as defined in the 1983 agreement. The airport is close to the park's south boundary, and published sound abatement procedures identify a preferred arrival approach from the south (use of Runway 01) and a preferred departure to the south (use of Runway 19). However, despite the preference for approaches and departures that avoid overflight of the park, factors that include prevailing winds, other weather conditions, and instrument flight procedures result in most approaches being made from the north and about 15% of the departures going north. On these flights, pilots are requested to stay east of the Snake River and/or U.S. Highway 26/89/191 (Jackson Hole Airport Board 2006b), but levels of conformance vary.

When pilots are flying in from the north under instrument flight rules (IFR), the air traffic control system routes aircraft into the area from the north or east toward a point about 15 miles north of the airport above Jackson Lake. At this location, aircraft are at an elevation of 11,000 feet above sea level, or approximately 4,200 feet above the ground surface. From there, they fly south at a glide slope of 3 degrees in an alignment with the runway that generally runs along the Snake River corridor between the base of the mountains and the highway. Landing aircraft are at a height of about 3,000 feet above ground level just west of the Teton Point Turnout on U.S. Highway 26/89/191 and fly over the Moose area at a height of about 1,000 feet above the ground.

Weather permitting, pilots leaving the Jackson Hole Airport are requested to make a takeoff toward the south. Aircraft flying in this direction cross the park boundary shortly after takeoff and are requested to bear left (east) as soon as practical to avoid overflight of the residential area. When a takeoff to the north is required, aircraft are requested to stay east of U.S. Highway 26/89/191 as soon as practical after takeoff, and to avoid climbs to the northwest over the park.

The Jackson Hole Airport Board has implemented a range of actions to minimize sound from aircraft operations. Some of these include a ban on the louder Stage 2 aircraft, enforced through Jackson Municipal Code 12-16-210B; traffic patterns that avoid the park, including preferential runway use; and a voluntary nighttime curfew that pilots are requested to observe except in emergencies. About six letters are issued per month to the owners or operators of aircraft for landings during the voluntary nighttime curfew period during the summer. During the winter, because of the shorter days, there are more operations, particularly arrivals, after dark (but before the beginning of the curfew at 11:30 P.M. for landings). However, few people are outside after dark during the winter. Therefore, there is a relatively low level of exposure to aircraft sound in the evening during the winter season.

A summary of the schedule for passenger airline service at the Jackson Hole Airport is available on the Internet at <http://www.jacksonholeairport.com/flightinfo_schedules.html>. On a typical day during the peak season:

- Between six and nine scheduled passenger flights depart the airport between 7:00 A.M. and 9:30 A.M., with the exact number varying seasonally and by day of the week.
- Scheduled passenger flights have a mid-day arrival peak, with several flights arriving between about 11:00 A.M. and 1:30 P.M. Following a turnaround that typically is less than an hour, these aircraft depart the airport for a variety of destinations.
- A second arrival peak occurs in the late afternoon and evening, and about six to nine passenger aircraft remain overnight at the airport. As of August 2010, the last scheduled arrival was at 9:07 P.M. and the last scheduled departure was at 7:24 P.M.

General aviation flights are not on a fixed schedule, and operations occur throughout the day. The pattern shown in Figure 6 for average operations by hour in July 2010 is typical, but the numbers of aircraft vary by month.

Information on sound relating to airport use is included in the natural soundscape section. As described there, current airport operations meet all noise requirements in the 1983 agreement, and the Jackson Hole Airport Board is committed to continued improvement in the management of sound.

Therefore, it is not expected that the sound and environmental management aspects of the alternatives would affect future airport operations or functionality.

Airport Ground Operations

In accordance with section 4(b) of the 1983 agreement, the Jackson Hole Airport Board "is deemed the operator of the airport as defined in the applicable Department of Transportation regulations, and, as such, is solely responsible for the operations, management, utilization and maintenance thereof." The exception is the interagency helibase, which is operated by the National Park Service in accordance with its general agreement with the Jackson Hole Airport Board and the July 30, 2003 amendment to the agreement.

Under contract to the Jackson Hole Airport Board, Jackson Hole Aviation, LLC has been the fixed-base operator at Jackson Hole Airport for nearly 20 years. Products and services provided by the fixed-base operator include aviation fuel, aircraft maintenance, ground equipment maintenance, private aircraft hangars, flight instruction, and charter service. The airport's contract with the fixed-base operator includes requirements for conformance with noise control measures. The contract also requires the operator to insert language into all subcontracts to ensure noise abatement plan compliance, and requiring them to distribute copies of the noise abatement plan to pilots departing the airport.

Scheduled passenger air service at Jackson Hole Airport was described in Chapter 1 under the heading "Current Use of the Jackson Hole Airport and Other Airports in the Region." The number of operations varies by season, but generally involves between 12 and 20 takeoffs and a similar number of landings each day. All of the Jackson Hole Airport Board's leases with scheduled passenger service airlines require them to ensure that their pilots are aware of the sound abatement rules and procedures and to take appropriate action against employees for operations contrary to the noise plan where there is no valid reason for noncompliance.

Terminal services include ticketing, check-in, baggage handling, and security for scheduled passenger service travelers. The Jackson Hole Airport Board is responsible for security under a contract with the Transportation Security Administration, and is one of the few entities nationwide to provide this service on a contract basis. The terminal also houses the administrative offices of the Jackson Hole Airport Board, airlines, and car rental companies.

Food services at the terminal are provided through a contract with a local restaurant. The large gift shop is operated by the Grand Teton Natural History Association, and proceeds help support educational, interpretive, and scientific programs in Grand Teton National Park. A smaller gift shop in the terminal helps support the National Wildlife Art Museum north of Jackson.

About a quarter of the development subzone is committed to automobile parking for scheduled passenger air service. Short-term parking is free, and long-term parking costs $8.00 per day. Additional parking areas that are used primarily for rental cars and general aviation are east of the hangars and in the southeast corner of the development subzone. Parking generally is readily available, although the number of spaces can be reduced substantially in the winter when parts of parking areas are used for storage of removed snow.

Three car rental companies have on-airport locations and collectively can have 200 or more automobiles parked at the airport within the development subzone. Onsite activities include the washing and refueling of vehicles and basic maintenance such as oil changes. As described in the "Water Quality and Hydrology" section, the used oil is hauled offsite and recycled. The tanks that collect sludge from the car wash are pumped out several times each year and the sludge is trucked offsite for proper disposal.

Ground transportation also is provided by several taxi services, shuttle services, and car rental companies. All taxi and shuttle services and the off-airport car rental companies utilize the courtesy telephone and park in assigned traffic lanes.

Aircraft and automobile fuels are stored in underground storage tanks that conform with Wyoming Department of Environmental Quality storage tank rules in Chapter 17 of the state's water quality rules and regulations and the U.S. Environmental Protection Agency requirements in Title 40, *Code of Federal Regulations*, Parts 280 and 281. In addition to fuels, the chemicals that are handled at the airport include propylene glycol for the winter deicing of aircraft, lubricating oils, and small volumes of solvents used for cleaning. Management of these substances was addressed under "Water Quality and Hydrology."

As a joint powers board created by the Town of Jackson and Teton County, the Jackson Hole Airport Board responds to emergencies at the airport on behalf of the county. Fire trucks and other emergency equipment are housed in the aircraft rescue and firefighting (ARFF) building south of the terminal. Personnel from the airport and National Park Service coordinate in fire rescue. Regular training and drills help ensure that appropriate emergency response is available.

All of the wastewater produced by airport operations in the development subzone flows by gravity to one of the three septic tank and leach field treatment systems in this zone. A separate septic tank and leach field was installed with the control tower and treats wastewater from this facility. Additional information on wastewater treatment is in the "Water Quality and Hydrology" section.

The Jackson Hole Airport Board contracts for a variety of other services that are needed to maintain operations at the airport. For example, snowplowing of parking lots is obtained from a commercial service, and Teton County provides herbicide application for weed control. These and other activities are coordinated with the National Park Service to ensure protection of park resources, such as obtaining NPS confirmation that all herbicides and other pesticides to be applied onsite are on the NPS-approved list.

During most winters, substantial volumes of snow are removed from the airport runway, taxiway, ramps, and parking areas. Currently, the Jackson Hole Airport has eight major pieces of snow removal equipment, and 12 people who can be assigned to snow removal so it can proceed around the clock. In winter 2006/2007 the cost of snow removal was about $600,000, which was paid for primarily by scheduled passenger service. Airport snow removal and management practices were described in the "Water Quality and Hydrology" section.

Payments to the U.S. Department of the Interior

Section 3 of the 1983 agreement specifies annual payments from the Jackson Hole Airport Board to the U.S. Department of the Interior equal to the sum of 1% of the first $200,000 of operating receipts (excluding grants and revolving funds), and 1.5% of all additional operating receipts. Payments made to the U.S. Department of Interior under this section have ranged between $30,000 and $50,000 annually, with payments totaling $371,000 over the last 10 years.

FEDERAL AVIATION ADMINISTRATION INVOLVEMENT WITH THE JACKSON HOLE AIRPORT

The Federal Aviation Administration is the lead federal agency for all aviation-related regulatory activities at the Jackson Hole Airport. The Jackson Hole Airport Board coordinates closely with the Federal Aviation Administration to ensure that all aspects of airport operations conform with federal rules and regulations. The National Park Service participates when decisions could affect the land on which the airport is constructed or other resources of Grand Teton National Park.

The Federal Aviation Administration is responsible for compliance with the National Environmental Policy Act relating to airport facilities or operations that are federally funded through its programs. However, all actions that are subject to National Environmental Policy Act compliance by the Federal Aviation Administration must comply with the terms and conditions of the 1983 agreement, and may require the concurrence of and/or additional environmental compliance by the National Park Service.

Part 139 Certification

Each year under Title 14, Part 139 of the *Code of Federal Regulations*, the Federal Aviation Administration performs a certification inspection of airports that support scheduled passenger aviation services. Some of the areas of concern include the condition of pavement and other facilities, firefighting equipment, fuel storage, training, and record-keeping.

Personnel from the Jackson Hole Airport Board, National Park Service, and fixed-base operator coordinate to ensure that all aspects of airport operations meet Federal Aviation Administration requirements. As a result, the airport consistently receives high scores. For example, the 2005 inspection found the airport in complete conformance and did not result in any deficiencies or notices for improvements.

Because Federal Aviation Administration grants to the Jackson Hole Airport represent more than 70% of all funding that is available to the airport for facilities maintenance and capital improvements, these grants are essential to maintain a level of airport safety and security that will support scheduled passenger service aviation. Under the 1983 agreement, the Jackson Hole Airport will lose its eligibility for these grants in 2013. Without this funding source, at some time in the future, the airport will no longer be able to maintain its Part 139 certification. At that time, all scheduled passenger service to the Jackson Hole Airport would cease.

Airport Classification

The National Plan of Integrated Airport Systems identifies 3,344 existing airports that are significant to national air transportation and, therefore, are eligible to receive grants under the Federal Aviation Administration Airport Improvement Program. Of these, 383 are classified as primary, with more than 10,000 annual passenger enplanements. The remainder are classified as commercial, reliever, and general aviation airports.

Based on the enplanements criterion, the Jackson Hole Airport (with at least 160,000 enplanements in each of the past 13 years) is classified as a primary airport. Primary airports annually receive at least $1 million in Airport Improvement Program funds, with the amount determined by the number of enplaned passengers. Based on 2006 enplanements, the Jackson Hole Airport received $1.7 million in Airport Improvement Program funds. Additional Airport Improvement Program funds may be made available to the airports based on need. The "Socioeconomics" section provides more information under the heading "Airport Funding."

Among primary airports, small hubs are defined as airports that enplane 0.05% to 0.25% of all annual passenger enplanements (or at least 369,500 of the total 739 million enplanements in 2005). Primary airports like the Jackson Hole Airport that enplane fewer passengers (250,165 enplanements at the Jackson Hole Airport in 2005) are categorized as non-hub primary airports. Collectively, the 247 primary airports in the non-hub category provide 3.1% of the nation's enplanements (Federal Aviation Administration 2004).

Airport Funding

Federal Aviation Administration funding is the most important source of revenue available to the Jackson Hole Airport Board. Money from the Federal Aviation Administration varies substantially by year, but overall it represents more than 70% of all funding that is used by the Jackson Hole Airport Board for facilities maintenance and capital improvements. Detailed information on Federal Aviation Administration grant funds under the Airport Improvement Program and passenger facility charges are provided in the affected environment description of "Socioeconomics."

USE TRENDS

The Jackson Hole Airport is the most important airport in Wyoming, accounting for more than 30% of all aviation-related jobs in the state, 40% of total annual expenditures of the state's general aviation visitors, and almost 75% of scheduled passenger service enplanements (Wyoming Department of Transportation 2004, Bishop 2009). However, as shown in Table 18, the number of operations at the airport varies from year to year.

Total airport operations in 2005 were 41% higher than the levels of about 23,000 operations per year that prevailed throughout the late 1980s and early 1990s (P&D Environmental Services 1997). Airport use demonstrated slower growth than occurred in the area's population: based on U.S. Census Bureau data presented in the "Socioeconomics" section, Teton County's population increased by 70% during this time and Jackson's population increased by 47%. The total number of operations at the airport has decreased since 2005, to approximately 29,000 in 2009. For 2010, the number of operations was almost 12% below 2009 levels through the month of July.

Existing conditions already constrain use of the Jackson Hole Airport. These conditions will continue into the foreseeable future and include:

- The size of the aircraft ramp. The lack of ramp space already restricts the number of general aviation aircraft that can park at the airport. The airport employs a parking reservation system during busy periods, such as around holidays in July and December, to provide pilots with assurances that they will be able to park their planes. Pilots who cannot obtain parking reservations must either choose another destination or drop off their passengers and fly out.
- The operational constraints of the single runway, particularly in instrument flight rules (IFR) conditions.

The airport is underutilized in the off-seasons of late autumn and early spring, but significant growth in these months is not expected.

The economy of the area and, therefore, the use of the Jackson Hole Airport, depends heavily on recreation, primarily including visits to national parks in the summer and to ski resorts in the winter. Some of the factors affecting recreational travel in the United States include the economy; gasoline prices; demographic changes, such as the aging of baby boomers; changes in popularity of foreign travel; and the growing popularity of home entertainment, including video games, Internet use, and the ability to watch movies at home (Pergams and Zaradic 2006). All of these probably contribute to the year-to-year changes that can be seen in airport operations at the Jackson Hole Airport and all will continue to affect the numbers of operations and enplanements in the future.

FORECASTS OF AIRCRAFT OPERATIONS

Aviation Industry-Wide Forecast

The U.S. Department of Transportation recently published 20-year aviation forecasts for the years 2010 through 2030 (Federal Aviation Administration 2010). Features of the forecast that potentially relate to future use of the Jackson Hole Airport are as follows:

- Aviation is subject to highly volatile and unpredictable external influences, some of which include the economy, fuel prices, global political climate, and environmental concerns.
- Available seat miles are expected to grow at an average of 3.6% per year through 2030. This includes a 3.0% increase for mainline carriers and 4.1% increase for regional carriers.
- The trend toward larger regional jets will continue while most of the smaller regional jets will be retired from the fleet.
- Enplanements will grow at an average annual rate of 2.4%, including a 2.2% increase for mainline carriers and 3.0% increase for regional carriers.
- The number of general aviation hours flown is projected to increase an average of 2.5% a year through 2030.
- General aviation for business use will expand at a faster rate than for personal or recreational use because of increased business use of fractional, corporate, and on-demand charter flights and the increasing availability and use of very light jets.
- There are projected to be just over 500,000 active general aviation pilots (excluding air transport pilots) in 2030, an increase of 0.5% annually throughout the forecast period.

The Federal Aviation Administration observes that in the short term, its forecast errors tend to be modest. However, it acknowledges that errors for 10-year forecasts are larger because of unanticipated external events that affect the aviation system. In its 2006 forecast, it also recognized that its long-term forecasts consistently have been too high and said that it was exploring ways to eliminate its bias toward growth. Despite that intent, many of the predictions it made that year proved to be too high and were reduced in the most recent forecast (Federal Aviation Administration 2006c, 2010).

Forecast of Airport Operations The Boyd Group, Inc.

The modeling associated with this environmental impact statement required a more detailed forecast of operations at the Jackson Hole Airport than was available from other sources. Therefore, the Jackson Hole Airport Board contracted with The Boyd Group, Inc. (2007a) to prepare a detailed forecast of operations in 5-year increments from 2010 through 2025. The factors that were considered by The Boyd Group, Inc. are described in the Alternative 1 analysis in Chapter 4 in the "Natural Soundscape" analysis under "Methods." Details of their forecasts, including numbers of operations by aircraft type and model for the years 2015 and 2025, are provided in that same location.

The Boyd Group, Inc. concluded that changes in fleet mix will slow future growth in number of operations by scheduled passenger carriers at the Jackson Hole Airport. In particular, an increase in the average size of regional carrier aircraft will increase capacity while reducing the number of operations. They predicted that in the year 2025, itinerant general aviation, consisting of business jet (45%), turboprop (15%), and piston (15%) aircraft, would represent almost 75% of airport operations. Regional carriers would represent 13% of operations, and major air carriers would account for 12% of operations.

The Boyd Group, Inc. also provided a caution about the reliability of forecasts because of rapid developments in the field of small aircraft. In particular, they state that, "The new breed of very light jets may render historical data and assumptions regarding business and general aviation useless in projections."

A second forecast of operations was prepared independently for the Airport Board as a component of the safety study for the airport (Mead & Hunt, Inc. 2009). That forecast showed a similar trend, with the number of operations expected to be approximately 37,000 by 2028.

JACKSON HOLE AIRPORT CAPACITY

Scoping identified concerns regarding the capacity of the existing airport area to accommodate the anticipated growth in operations. Studies have not been conducted to determine the airport's long-range operational capacity. However, comparisons to current conditions can be used to make reasonable projections regarding capacity.

The most restrictive conditions at the Jackson Hole Airport occur when pilots are flying under instrument flight rules (IFR). Under these conditions, aircraft operations are spaced at three-minute intervals, which limits the airport to 20 operations per hour.

- Currently, as was shown in Table 18, the airport averages about 90 operations per day. The Boyd Group, Inc. forecasts modest growth in Jackson Hole Airport operations between now and 2025. Therefore, the capacity to handle operations on the typical day should not be a problem well into the future.
- On a few peak days around holidays, the Jackson Hole Airport handles more than 200 daily operations. This already results in crowding around popular times, particularly when instrument flight rules are in effect. However, with appropriate coordination among pilots, tower personnel, and airport staff, the airport will have adequate daily capacity to handle peak demand beyond the 2033 timeframe of this environmental impact statement.

Ramp space for general aviation aircraft parking already is a limiting factor on peak days around holidays. As a result, the Jackson Hole Airport Board has implemented a reservation system for ramp parking. This situation has little effect on fractional ownership or charter services, where the passengers are dropped off and the aircraft departs to provide service to others. Pilots who wanted to park but who could not obtain a reservation would continue to be inconvenienced by the parking limitations.

As described previously, during the peak season from six to nine aircraft that provide scheduled passenger service park overnight at the Jackson Hole Airport and make morning departures. Based on forecasts from The Boyd Group, Inc. (2007a), these numbers are not likely to change between now and 2025. However, if it was justified by demand, the Jackson Hole Airport Board could potentially increase the amount of the ramp area available for scheduled passenger service aviation by decreasing the amount available for general aviation.

PUBLIC HEALTH AND SAFETY

This section describes the existing conditions and issues related to public health and safety of airport operations, including public health and safety in the park and at the Jackson Hole Airport, community health and safety and emergency response related to the airport, highway safety related to airport vehicle traffic, and airport storage and use of hazardous materials. It also presents the potential impacts on public health and safety for each alternative. Because the airport has regional significance and influence, public health and safety related to airport operations is addressed for the park and regionally.

PUBLIC HEALTH AND SAFETY IN NATIONAL PARKS

Section 8.2.5 of *Management Policies 2006* (NPS 2006a) states that the National Park Service "will seek to provide a safe and healthful environment for visitors and employees . . . [and] will strive to identify and prevent injuries from recognizable threats to the safety and health of persons and to the protection of property by applying nationally accepted codes, standards, engineering principles, and the guidance contained in Director's Orders #50B [Occupational Safety and Health Program], #50C [Public Risk Management Program], #58 [Structural Fire Management], and #83 [Public Health], and their associated reference manuals." The visitor safety and emergency response provisions in *Management Policies 2006* apply to all allowable activities and congressionally designated purposes and mandates within national parks, including the Jackson Hole Airport within Grand Teton National Park.

JACKSON HOLE AIRPORT SAFETY REQUIREMENTS

The Jackson Hole Airport is a class 1 airport with regularly scheduled air carrier service. The airport is fully certified under Title 14, *Code of Federal Regulations*, Part 139. As part of this certification, the airport maintains an airport certification manual and airport emergency plan that outline the specific measures it uses to comply with the Part 139 health and safety requirements.

A safety self-inspection program requires personnel to assess compliance with the airport certification manual and airport emergency plan twice daily. These inspections include assessing the condition and operation of the airfield's fueling equipment, emergency response equipment, emergency response personnel, navigational aids, pavement, markings, lighting, signage, unpaved safety areas, vegetation, obstructions, wildlife, and construction affecting the operation of aircraft. These daily inspections are confirmed by an onsite annual inspection by the Federal Aviation Administration's Airports Division based in Renton, Washington.

When non-compliant items are found, they must be corrected. Documentation of the discovery of non-compliant items and their correction are kept for 24 consecutive months. If a combination of non-compliant items causes the airport to be in violation of its certification, the airport operator must notify the Federal Aviation Administration, as well as airmen and air carriers using the airport, by issuing a notice to airmen (NOTAM). If the non-compliant items are not corrected, the airport could lose its Part 139 certification.

For aircraft rescue and firefighting (ARFF), the Federal Aviation Administration categorizes airports into indexes. An airport's index determines the number of emergency vehicles, and the amount and type of firefighting agent/s required. The index for the Jackson Hole Airport is "C."

The airport employs 16 full-time firefighters to respond to all fire, hazardous material, and medical emergencies on the airport. Of these, five have additional duties as law enforcement officers. In addition to patrolling the property, they respond to security, criminal, and disturbance calls.

Despite the measures to ensure a safe operating environment at the Jackson Hole Airport, accidents and incidents occur. As defined by the Federal Aviation Administration's "Notification and Reporting of Aircraft Accidents or Incidents" in Title 49, *Code of Federal Regulations*, Part 830.2:

> "*Aircraft accident* means an occurrence associated with the operation of an aircraft . . . in which any person suffers death or serious injury, or in which the aircraft receives substantial damage."
>
> "*Incident* means an occurrence other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations."
>
> *"Serious injury* means any injury which: (1) Requires hospitalization for more than 48 hours, commencing within 7 days from the date of the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, muscle, or tendon damage; (4) involves any internal organ; or (5) involves second- or third-degree burns, or any burns affecting more than 5% of the body surface."
>
> *"Substantial damage* means damage or failure which adversely affects the structural strength, performance, or flight characteristics of the aircraft, and which would normally require major repair or replacement of the affected component. Engine failure or damage limited to an engine if only one engine fails or is damaged, bent fairings or cowling, dented skin, small punctured holes in the skin or fabric, ground damage to rotor or propeller blades, and damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wingtips are not considered 'substantial damage' for the purpose of this part."

Title 49, *Code of Federal Regulations*, Part 830.5 "Immediate Notification" states:

"The operator of any civil aircraft, or any public aircraft . . . shall immediately, and by the most expeditious means available, notify the nearest National Transportation Safety Board field office when:

> "(a)An aircraft accident or any of the following listed incidents occur:
>
> > "(1) Flight control system malfunction or failure;
> >
> > "(2) Inability of any required flight crew member to perform normal flight duties as a result of injury or illness;
> >
> > "(3) Failure of structural components of a turbine engine excluding compressor and turbine blades and vanes;
> >
> > "(4) In-flight fire; or
> >
> > "(5) Aircraft collide in flight.
> >
> > "(6) Damage to property, other than the aircraft, estimated to exceed $25,000 for repair (including materials and labor) or fair market value in the event of total loss, whichever is less.
> >
> > "(7) For large multi-engine aircraft (more than 12,500 pounds maximum certificated takeoff weight):

"(i) In-flight failure of electrical systems which requires the sustained use of an emergency bus powered by a back-up source such as a battery, auxiliary power unit, or air-driven generator to retain flight control or essential instruments;

"(ii) In-flight failure of hydraulic systems that results in sustained reliance on the sole remaining hydraulic or mechanical system for movement of flight control surfaces;

"(iii) Sustained loss of the power or thrust produced by two or more engines; and

"(iv) An evacuation of an aircraft in which an emergency egress system is utilized.

"(b) An aircraft is overdue and is believed to have been involved in an accident."

The National Transportation Safety Board's interactive website titled "Accident Database and Synopses" is available on the Internet at http://www.ntsb.gov/ntsb/query.asp. This website was queried to obtain information on aircraft accidents reported in association with the Jackson Hole Airport from January 1, 1990 through July 1, 2008 (18.5 years). During this period, a total of 28 aircraft accidents were reported. Not all of these accidents involved operations at the airport, but it was the nearest airport and, therefore, was listed on the National Transportation Safety Board investigation reports. For example, several of the accidents involved crashes into the mountainous terrain up to 40 miles from the Jackson Hole Airport.

- Twelve years had accidents that met reporting criteria of the National Transportation Safety Board. The greatest numbers of accidents occurred in 2000 and 2001, with four accidents each year.
- General aviation accounted for 22 of the 28 accidents. Air taxi and commuter aircraft were involved in three accidents. Two accidents, which involved agency firefighting aircraft, were classified as public use. One of the accidents involved scheduled passenger air service.
- Pilot error was a primary or contributing factor in at least 19 accidents. In seven cases, poor weather conditions were cited. These included wind shear or gusts, poor visibility, and ice or snow. Mechanical or maintenance problems were the source of eight accidents.
- The area's steep terrain poses hazards. Three of the four fatal accidents resulted from crashes into mountains.
- Two collisions caused four of the reported accidents. During firefighting operations in 2001, one helicopter was entangled in the cable and bucket of another. The other collision occurred on the ground in 1994 and involved two taxiing, fixed-wing aircraft.

In addition to the accidents listed above, the Jackson Hole Airport maintains records on incidents that do not meet the immediate notification criteria of 49 *Code of Federal Regulations* Part 830.5. From January 1998 through June 2008 (10.5 years), excluding the accidents cited above, a total of 43 incidents were recorded.

- Aircraft incidents occurred in every year. The greatest number of incidents occurred in 2005 and 2006, with seven incidents in each year. The average annual number of incidents for the time period is 4.1 per year.
- General aviation accounted for 36 of the 43 incidents. Seven of the incidents involved scheduled passenger air service.
- Mechanical failure or tire failure was the primary emergency in 18 of the incidents. Seven were caused by smoke or fire on board the aircraft (of which two were commercial). Seven were runway over-runs (of which three were commercial). Seven incidents were caused by cockpit indica-

tions of unsafe systems. A bird strike caused one incident (commercial). Pilot error was the major contributing factor to two incidents.

- Among the above-listed incidents, scheduled passenger service aircraft were involved in one mechanical incident, two incidents involving smoke or fire, three runway excursions (overruns), and one bird strike. Additional information on bird strikes was provided earlier in this chapter in the section on wildlife.

COMMUNITY HEALTH AND SAFETY (EMERGENCY RESPONSE)

The town of Jackson and the surrounding communities, national parks and forests, and resorts are in a relatively isolated setting in western Wyoming. During public scoping for this environmental impact statement, concern was expressed about transportation from the Jackson Hole Airport as it relates to community health and safety.

The Jackson area is served by a network of state and federal highways that provide access from the:

- South along U.S. Highways 89, 189, and 191;
- West along U.S. Highway 26 and Wyoming Highway 22;
- North along U.S. Highways 26, 89, and 191; and
- East along U.S. Highway 26 and 287.

In addition, Interstate 15 is about 100 miles west of Jackson and Interstate 80 is about 200 miles south of the town.

All of these road are well maintained by the Wyoming Department of Transportation, Idaho Transportation Department, or local governments. They function effectively year-round as conduits to the area for food, fuel, medicine, and other goods.

The town of Jackson is served by St. Johns Medical Center, a 108-bed hospital that is fully approved by the Joint Commission on Accreditation of Healthcare Organizations (St. Johns Medical Center 2006). St. Johns Medical Center is the primary regional medical institution for northwest Wyoming, and its campus on the northeast side of the town includes a medical evacuation helicopter landing pad. Other medical resources in the area include much smaller facilities in Driggs, Idaho (36 miles away) and Afton, Wyoming (70 miles away). The nearest large facility is the 340-bed Eastern Idaho Regional Medical Center in Idaho Falls, more than 90 miles and more than 2 hours distant by car.

Data on medical evacuations were obtained from St. Johns Medical Center (Boss 2006). Typically, there are about 150 medical evacuations by air per year from the Jackson area. Of these, 50 or 60 are by helicopter. These flights do not use the Jackson Hole Airport or the interagency helibase. Helicopters from Idaho Falls or Salt Lake City can make the round-trip flight without refueling, while helicopters arriving from greater distances refuel at the Eastern Idaho Regional Medical Center in Idaho Falls before stopping at the helipad at St. Johns Medical Center to pick up the patient and return to their home facility.

Fixed-wing air ambulance services fly patients from the Jackson Hole Airport to other locations, including the Portneuf Regional Medical Center in Pocatello, Idaho (Avcenter, Inc. 2009) and the University of Utah Hospital in Salt Lake City (Gutmann 2009). The lives of patients using fixed-wing air ambulance services typically are not in imminent danger (Boss 2006), but fixed-wing aircraft are sometimes able to support medical missions into Jackson when helicopters cannot fly into the valley because adverse weather (Gutmann 2009). Medical evacuations also include emergency medical tickets on scheduled passenger service flights. Medical evacuations involving fixed-wing aircraft range from serious cases to area visitors who, after the resolution of a medical problem, are trying to catch up to their tour groups (Boss 2006).

The Jackson Hole Airport also supports visiting physician services. Avcenter, Inc. (2009) reports that it transports doctors from the Jackson Hole Airport every week to outlying clinics in Rock Springs and Kemmerer. This service allows these doctors to bring health care to Wyoming residents who would otherwise have to travel long distances to medical specialists.

PUBLIC HEALTH AND SAFETY ON HIGHWAYS

Wyoming is among the most dangerous states in the nation for automobile travel, based on data from *Traffic Safety Facts 2004: A Compilation of Motor Vehicle Crash Data from the Fatality Analysis Reporting System and the General Estimates System* (U.S. Department of Transportation 2004). Specifically, traffic fatalities per 100,000 population and fatalities per 100,000 licensed drivers are more than twice the nationwide values. Wyoming also has a much-higher-than-average rate of fatalities per 100 million vehicle miles of travel:

- In 2004, the Wyoming rate was 1.77 traffic fatalities per 100 million vehicle miles of travel, which is 23% higher than the national average of 1.44.
- Wyoming's non-Interstate rural roads, which had a 2004 fatality rate of 2.13 per 100 million vehicle miles of travel, were more dangerous than its Interstate or urban roads (1.49 fatalities per 100 million vehicle miles of travel) (TRIP 2006).

For the 5-year period from 2000 through 2004, three road segments in Teton County were identified among the top 25 Wyoming roads with the highest fatality and serious injury rates (TRIP 2006). Table 19 provides information on these road segments. None of these roads are near or provide access to the Jackson Hole Airport.

TABLE 19: TETON COUNTY ROADS AMONG THE 25 WYOMING ROADS WITH HIGHEST FATALITY AND INJURY RATES, 2000 THROUGH 2004 [a/]

Rank	Route and Location	Length (miles)	Fatalities	Injury	Average Daily Trips
4	Wyoming 22 west of Jackson to the Idaho state line	17	7	37	7,238
12	U.S. Highway 26/89/191 between Hoback Junction and Jackson	14	4	29	9,353
25	U.S. Highway 26/89 between Alpine Junction and Hoback Junction	23	5	21	3,487

a/ Source: TRIP 2006. An injury is an condition that required medical treatment.

The injury-to-fatality ratio that can be calculated for these three road segments ranged between 4.2- and 7.2-to-1, and averaged 5.3 injuries per fatality. This fatality ratio is much worse than the 65.3 injuries per fatality that can be calculated from the 2004 national statistics of 94 injured persons and 1.44 fatalities per 100 million vehicle miles traveled (U.S. Department of Transportation 2004).

The Wyoming Department of Transportation (Adams-Gierisch 2006) provided data for all crashes that occurred on three road stretches of interest for the 5-year period of 2001 through 2005. A summary of the data, with all values standardized to incidents per 100 million miles traveled, is provided in Table 20.

TABLE 20: ACCIDENT RATES FOR ROAD SEGMENTS OF INTEREST, 2001 THROUGH 2005 [a/]

Highway Stretch	Length (miles)	Annual Average Per 100 Million Miles Traveled			
		Crash Rate	Total Crashes	Persons Injured	Persons Killed
U.S. Highway 26/89/189/191/287 from Hoback Junction (milepost 141.30) to Moose (milepost 170.00)	28.7	245	206	77.8	1.7
Wyoming Highway 22 from Idaho state line (milepost 0.00) to Jackson (milepost 17.49)	17.5	224	105	88.2	3.6
U.S. Highway 26/89 from Hoback Junction (milepost 141.29) to Alpine Junction (milepost 118.32) plus Alpine Spur (milepost 0.0 to 2.37)	25.3	145	45	61.9	3.9

a/ All rates per 100 million miles traveled were calculated from the data provided by the Wyoming Department of Transportation (Adams-Gierisch 2006)

The nature of accidents differed between areas close to Jackson and other areas.

- Close to Jackson, most accidents involved two or more motor vehicles and most commonly occurred at intersections. Accident causes included improper turning, failure to yield the right-of-way, following too closely, and inattentive driver.
- Greater percentages of single-vehicle accidents occurred outside the Jackson area. Following too closely and inattentive driver again were often-cited contributing factors, as were unsafe speed and driving under the influence of alcohol or drugs. Approximately a third of accidents involved more than one motor vehicle; a third involved collisions with fixed objects; and a third involved impacts with animals, most commonly including deer and elk and less frequently with moose and horses.

HAZARDOUS MATERIALS STORAGE AND USE AT THE AIRPORT

Public health and safety concerns in association with the storage and use of hazardous materials at the airport were identified during scoping. The management of fuels, glycol deicer, lubricants, and solvents that are classified as hazardous, or that can be perceived as posing a threat to human health and welfare or the environment was described in the "Water Quality and Hydrology" section. As described there, these materials are stored, used, and disposed at the Jackson Hole Airport in strict compliance with federal and state laws and regulations to ensure that they are not polluting surface or ground water. Annual inspections by the Federal Aviation Administration confirm the safe management of fuels and other flammable or explosive substances.

SOCIOECONOMICS

The geographic area considered for the analysis of socioeconomic conditions and environmental consequences consists of the three-county region of Teton County, Wyoming; Lincoln County, Wyoming; and Teton County, Idaho. The communities of Jackson and Alpine, Wyoming, and Driggs and Victor, Idaho, also are included in the analysis. Within this area, the primary focus is on Teton County, Wyoming and the town of Jackson. Some of the features that affect the socioeconomic setting include the following.

- The town of Jackson is a primary gateway community, providing year-round visitor lodging and other services, for Grand Teton National Park and Yellowstone National Park, two of the most popular units in the national park system.
- Summer is the peak tourist season. During this time, the area offers many recreational opportunities, such as viewing scenery and wildlife, driving for pleasure, hiking and backpacking, whitewater rafting, and horseback riding.
- During the winter, the area provides world-class downhill skiing opportunities at the Jackson Hole Mountain Resort, Snow King Resort, and Grand Targhee Resort, and additional recreation in national forests, particularly including the Bridger-Teton and Caribou-Targhee National Forests.
- Seasonal residents with second homes in the area represent an important component of visitation to Teton County and Jackson.

GROWTH-RELATED CONCERNS OF THE PROJECT AREA

In the late 1970s, Jackson began to experience rapid growth as a result of increased tourism. According to the *Jackson/Teton County Comprehensive Plan* (2002), some of the issues that developed in association with this growth included sustaining development and growth management, preserving quality of life, maintaining and enhancing community and rural character, balancing community and economy, and ensuring affordable housing. The *Jackson/Teton County Comprehensive Plan* was adopted in 1994 and has been updated, most recently in 2002, with a new revision currently underway. The plan identifies growth-related issues, establishes goals and objectives, and provides guiding principles and strategies to address the issues.

Operations at the Jackson Hole Airport have increased to support the growth in local tourism and the development of the resort industry. Although scheduled passenger service began in 1941, until the 1970s the airport primarily served local general aviation that used propeller-driven aircraft. Currently, however, local general aviation represents only about 10% of the airport's operations.

DEMOGRAPHICS

Population

Population trends and projections in the three-county area are shown on Table 21. In 2000, the total population of the three-county area was 38,823 people, a 43% increase from the 1990 population. This rate of population growth greatly exceeded the rates for the states of Wyoming (9%) and Idaho (28%) during this period. Teton County, Wyoming had the greatest absolute growth, while Teton County, Idaho had the greatest relative increase (74%). Teton County, Wyoming accounted for more than 60% of the population growth in the three-county area during the 1990 to 2000 period.

TABLE 21: POPULATION TRENDS AND PROJECTIONS

County/City	1990 Population [a/]	2000 Population [a/]	Percent Change (1990 to 2000)	2004 Population Estimates [b/]	2010 Projected Population [/]
Teton County, Wyoming	11,173	18,251	63	18,964	22,352 [c/]
Lincoln County, Wyoming	12,625	14,573	15	15,626	16,466 [c/]
Teton County, Idaho	3,439	5,999	74	7,253	9,550 [d/]
Total	27,237	38,823	43	41,843	48,368
Alpine	200	550	175	769	
Driggs	846	1,100	30	1,137	not available
Jackson	4,708	8,647	84	8,966	not available
Victor	292	840	188	1,216	not available
Wyoming	453,588	494,782	9	505,887	519,886 [f/]
Idaho	1,006,749	1,293,953	28	1,395,140	1,517,291 [e/]

a/ Source: U.S. Census Bureau 2000.
b/ Source: U.S. Census Bureau 2004b.
c/ Source: Wyoming Department of Administration and Information 2004.
d/ Source: Estimated; population projections not available for Idaho counties.
e/ population projections are not made at this geographic level.
f/ Source: U.S. Census Bureau 2005.

Jackson almost doubled in population during this period, and accounted for a third of the population growth within the three-county area. The populations of the much smaller communities of Alpine and Victor almost tripled. Part of the population and housing growth in Driggs, Victor, and Alpine is the result of service workers who live in these communities and commute to Jackson.

As shown in Table 21, continuing population growth is expected in the area. However, future development and population growth in Teton County, Wyoming will be somewhat constrained because only 3% of the land is in private ownership. The rest of the county is federally owned.

Because the census is completed in April, resort areas such as Jackson and Teton County typically are undercounted. During this time, seasonal employees have left the resorts, permanent employees may be on vacation, and seasonal residents are living in their primary homes. To address these undercounts, local planners typically use a combination of existing housing units, building permits, and household population factors to more accurately estimate the population. In addition to the resident population, Teton County, Wyoming can have a tourist population that is more than twice the resident population. Tourists contribute an additional 35,000 or more to the population of this county during the peak summer season.

Housing

There were almost 20,000 housing units in the three-county area in 2000, more than half of which were in Teton County, Wyoming. The number of housing units increased by 40% during the 1990-to-2000 period. Most (70%) are single-family residential structures (U.S. Census Bureau 2000).

Housing is least available, and therefore least affordable, in Teton County, Wyoming. For example, the median value of owner-occupied housing in 2000 was $344,000 in Teton County, Wyoming, compared to $132,000 in Teton County, Idaho and $92,000 in Lincoln County, Wyoming (U.S. Census Bureau 2004a). In 2008, the average sales price of a single-family home in Teton County, Wyoming rose to $1,829,237, in contrast to the state of Wyoming's average sales price of $256,045 for the same time period (Wyoming Community Development Authority 2010).

Table 22 portrays county-to-county, residence-to-workplace daily commuter flows (U.S. Census Bureau 2000). Residents of eight counties in Wyoming and Idaho commute to workplaces in Teton County, Wyoming. More than 70% of these commuters reside in Teton County, Idaho and Lincoln County, Wyoming. This commuting pattern is the result of job creation by the resort and tourist industry and the lack of affordable housing in Teton County, Wyoming.

TABLE 22: RESIDENCE-TO-WORKPLACE COMMUTER FLOWS, 2000 [a]/

Residence County	Workplace County	Number of Commuters
Inflow from		
Teton County, Idaho	Teton County, Wyoming	1,014
Lincoln County, Wyoming		895
Sublette, Fremont, and Natrona County, Wyoming		213
Bonneville, Fremont, Bingham, and Madison County, Idaho		218
Other		337
Total inflow		2,677
Outflow from		
Teton County, Wyoming	Teton County, Idaho	101
	Other Wyoming, Idaho, and Utah counties	91
	Other	154
Total outflow		346
Net inflow		2,331

a/ Source: U.S. Census Bureau 2000.

Calculations using Bureau of Economic Analysis (2004) data for personal income show the same pattern as Table 22. In Teton County, Wyoming, earnings outflow to people residing in other counties far exceeds earnings inflow. The outflow of personal income from this county increased from 2.9% in the 1980s (Sonoran Institute 2002) to 10.7% in 2000 (Bureau of Economic Analysis 2004), indicating that job commuting to Teton County, Wyoming has increased substantially during the last two decades.

There has been substantial residential development throughout the three-county area. Supportive commercial development has occurred, primarily along the highways in and near Jackson. The highly desirable scenic, wildlife, and outdoor recreation resources of the area have stimulated development to support seasonal tourism, plus non-resident, second-home development. The U.S. Census Bureau in year 2000 census results classified 21% of all housing units in Teton County, Wyoming as "seasonal use" units that typically are used by non-residents as second homes. This residential development has resulted in rapidly rising real estate values, conversion of working ranches to residential developments, and lack of affordable housing.

Between 1998 and 2004 in the three-county area, building permits were issued for more than 5,000 housing units, for an average of more than 700 units annually. More than 40% of the residential building permits during this period were for Teton County, Wyoming. However, residential construction has increased recently in the other two counties because they offer more affordable housing.

ECONOMICS

Labor Force and Employment

Based on place of residence, the average annual civilian labor force in the three-county area in 2004 was 26,400. In the five years from 1999 to 2004, this labor force increased by 20%, compared to an eight% increase for the labor force for the state of Wyoming (Bureau of Labor Statistics 2005).

Just over half (53%) of the three-county labor force is in Teton County, Wyoming, where monthly employment levels are seasonal and vary widely. June through August is the highest employment period and March through May is the lowest employment period. The percentage of local employment in the accommodation and food services sector in Teton County is almost four times greater than the national level; in the construction sector, it is more than two times greater. The annual unemployment rate in 2004 for the three-county area was 3.4%, compared to 3.9% and 4.7%, respectively, for the states of Wyoming and Idaho (Bureau of Labor Statistics 2005).

Table 23 identifies the major employers in Teton County, Wyoming. The resort/tourist industry dominates, and six of the eight largest employers are directly associated with this industry. As shown in the table, employers in this sector have strong seasonal employment peaks, and employment during the summer peak tourist season is approximately 50% greater than during the winter peak season.

Teton County, Wyoming ranks first in the state with regard to median household income and per capita personal income ($73,897 in 2003). In 2003, this county had a total personal income of $1.382 billion. Total 2003 total personal incomes for Lincoln County, Wyoming and Teton County, Idaho were $414 million and $146 million, respectively, with per capita incomes of $27,156 and $20,633, respectively.

Income and Tax Revenues

Compensation of employees for each Teton County, Wyoming industry sector that represented at least 5% of the county total in 2003 is shown in Table 24. Accommodations and food services dominated, accounting for almost 20%. Construction, at more than 15%, indicates the

TABLE 23: MAJOR EMPLOYERS, TETON COUNTY, WYOMING [a/]

Employer	Number of Employees	
	Summer	Winter
Grand Teton Lodge Company	1,000	40
Grand Teton National Park	330	140
St. John's Hospital	500	500
Teton County School District	50	380
Snow King Resort	222	270
Signal Mountain Lodge	140	6
Jackson Hole Mountain Resort	200	940
Grand Targhee Resort	125	325

a/ Source: Jackson Hole Chamber of Commerce 2006. Year-round employment at the Jackson Hole Airport is about 485 full-time-equivalent positions, but these people work for multiple employers, some of which include the airport, fixed-base operator, airlines, car rental agencies, stores, and restaurant.

TABLE 24: COMPENSATION OF EMPLOYEES BY INDUSTRY SECTOR, TETON COUNTY, WYOMING, 2003 [a/]

Industry Sector	Total Wage/Salary Compensation ($ million)	Percent of Total
Accommodations and food services	127.0	19.7
Construction	$100.7	15.6
Government	98.8	15.3
Retail trade	57.7	9.0
Professional/technical services	47.6	7.4
Finance/insurance	36.2	5.6
Total for county	$642.4 [a/]	100.0 [a/]

a/ Source: Bureau of Economic Analysis 2004. Values do not add up to total because smaller industry sectors were omitted.

high degree of development activity. Government, also at more than 15%, reflects the federal ownership of 97% of the land in the county and the presence of land managers and interpretive staff.

Sales and use tax generated by Teton County, Wyoming increased from $47.7 million in 2001 to $52.6 million in 2005 (Wyoming Department of Revenue 2006), a total increase of 10% over the 5-year period. The retail trade and accommodations/food services business sectors account for about 70% of the total sales tax generation in Teton County, Wyoming.

Property Values

Although some changes in property valuations result from annual reassessments, most property value increases in Teton County, Wyoming reflect real property and improvements through new construction of buildings and facilities that are added to the tax rolls. Therefore, property valuation trends are a good indicator of construction activity and economic growth in the area.

From 2001 through 2005, Teton County, Wyoming registered a 35% increase in total real property assessed values, or an average of 8% per year. Residential and commercial valuations accounted for virtually the entire increase. Residential property represents 85% of the total real property assessed valuation in the County. The increases in assessed valuation have led to increased property tax revenues.

TOURISM AND RECREATION

In Teton County, Wyoming, employment, earnings, and business volumes are dominated by industry sectors that serve tourism. Most of the development in Teton County and Jackson reflects the supportive services associated with the tourist/resort industry, and with meeting the needs of non-residents who are interested in or are establishing seasonal residence. The local national parks, wildlife refuge areas, ski resorts, scenic attractions, and seasonal activities provide passive and active recreational activities and opportunities throughout the year.

Tourism Modes of Travel

The modes of transportation visitors use to arrive in the region vary

- A survey by the National Park Service in summer 2008 determined that 10% of visitors arrived by commercial airline to the Jackson Hole Airport. Less than 2% arrived by transportation modes that included commercial airlines to Salt Lake City, Cody, Bozeman, Idaho Falls, or Rapid City (Braak *et al.* 2009)
- According to the Jackson Hole Chamber of Commerce (2006), approximately 90% of summer visitors to the Jackson area arrive by car, while 90% of winter visitors arrive by air.
- Surveys conducted in the summer of 2005 and winter of 2004/05 (RRC Associates) indicated that approximately 6% of summer visitors to Grand Teton National Park arrived by air, while 90% of winter visitors arrived by air.
- A survey conducted in July 1997 indicated that 12% of the summer visitors to Grand Teton National Park arrived by air (Littlejohn 1998).

The average winter stay in the Jackson area is 5.7 days, compared to an average stay of 7.2 days in summer (RRC Associates). Major sites that attract visitors include Grand Teton National Park, the National Elk Refuge, and the three ski resorts in the Jackson area.

Grand Teton National Park

Figure 10 portrays annual visitation at Grand Teton National Park during the 1995 through 2006 period. Annual visitation has remained relatively stable throughout the period. There are approximately 4 million annual visits, including 2.5 million recreational visits. More than 90% of the recreational visitors are non-local. Recreational visits are those with a primary purpose of sightseeing or recreating in the park, and do not include the 1.5 million visits involving through-traffic, business purposes, and entrance by residents and employees. Annual fluctuations result from factors such as forest fires, drought, fuel prices, and state of the economy.

As portrayed in Figure 11, seasonal recreational visits vary considerably. The summer season, June through September, typically accounts for 75% or more of total annual recreational visits. In 2006, visits during the six month period from November through April accounted for less than 11% of the total annual recreational visits. A visitor survey found that 42% of visitors spent less than a day in the park. Just over a quarter of the visitors spent 2 to 3 days, and about 7% reported staying from 7 to 13 days (Smaldone 2001).

There are more than 20 concessioners providing services in Grand Teton National Park. Collectively, they had annual gross receipts of $26.5 million in 2004. The concessions include lodging, food services, retail services, campground operations, service stations, marina, medical clinic, and guide operations that include floating and fishing. Lodging generates more than 40% of total annual concessioner revenue. Employee housing for 1,000 people at peak season is provided within Grand Teton National Park, with an additional 71 employee recreational vehicle sites.

FIGURE 10: VISITATION TRENDS 1995 THROUGH 2006
Source: National Park Service 2007a.

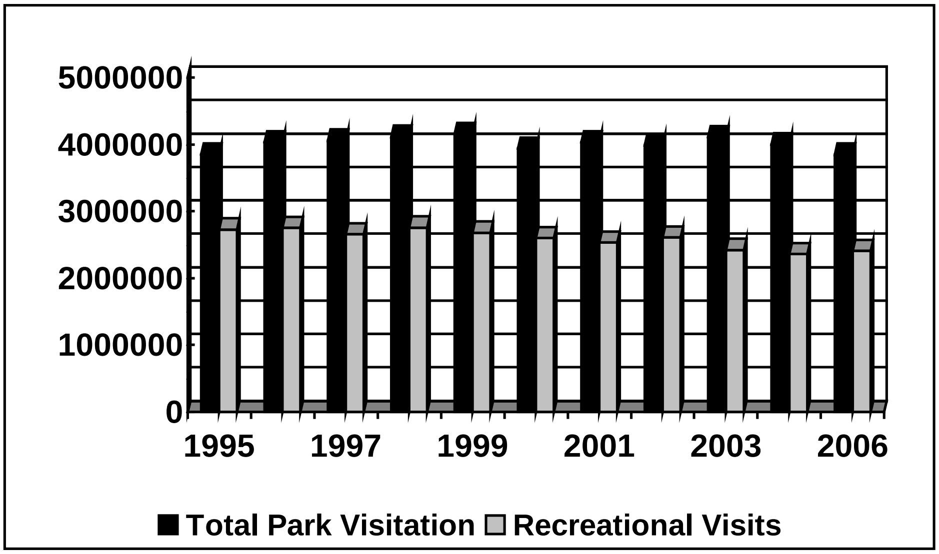
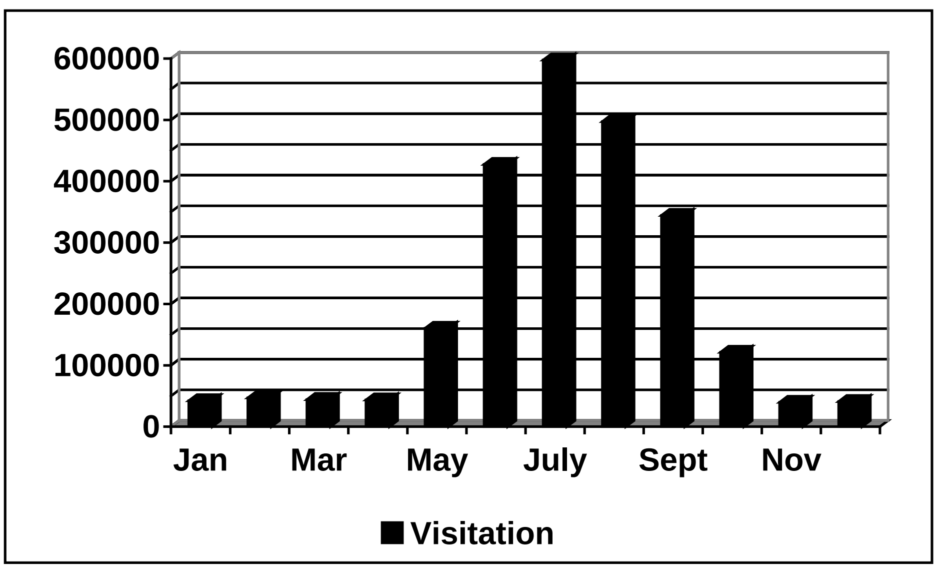


FIGURE 11: RECREATION VISITS, 2006
Source: National Park Service 2007a.



Major employers within Grand Teton National Park include the National Park Service, the Jackson Hole Airport, and park concessioners (NPS 2006b).

- There are approximately 2,300 employees in the park during the summer. The largest sources of employment are the National Park Service with about 150 permanent employees and 200 seasonal employees; the Jackson Hole Airport, which provides year-round employment for about 485 full-time-equivalent positions; and Grand Teton Lodge Company, which has about 1,000 summer employees. The remaining summer employment is provided by the other concessioners.
- The winter employment of about 635 includes the 150 permanent NPS staff and 485 airport positions.

Visitor survey results (Loomis and Caughlan 2004) show that non-local park recreational summer visitors spent $77 to $97 per person per day in the Jackson area. Non-local recreational winter visitors spent $98 to $113 per person per day. At current visitation levels, this visitor spending (direct and indirect) would total approximately $590 million annually in the economies of Teton County, Wyoming and Teton County, Idaho.

- This level of visitor spending directly accounts for $200.1 million in personal income and 10,658 jobs, representing 19% of total local income and 42% of local employment.
- Including both direct and indirect impacts, visitor spending accounts for $306.4 million annually in personal income and 14,200 jobs in the two counties.

Thus, current recreational visitation to Grand Teton National Park accounts for almost 30% of total direct and indirect personal income, and 56% of direct and indirect employment in the Jackson area (Loomis and Caughlan 2004).

Surveys of airline passengers as they were leaving the area through the Jackson Hole Airport were conducted in winter 2004/2005 and summer 2005 (RRC Associates 2005). The survey was designed to document the airport's impact on the local economy. Results showed that:

- Total summer scheduled passenger service enplanements were about 6% of the summer recreational visits to Grand Teton National Park.
- Eighty-two percent of the non-local visitors visited Grand Teton National Park, while 70% visited the National Elk Refuge or participated in wildlife viewing.
- Summer visitors leaving by scheduled passenger air service had spent an average of $211 per day, which typically included $183 per day for lodging, food/beverages, shopping, and recreation.

Based on the number of non-local visitor enplaned passengers (114,660) during the 2005 summer season (June through September), it was estimated that the direct impact of the non-local-visitor total aggregate spending was approximately $174.2 million, based on a 7.2-day average length of stay.

National Elk Refuge

The National Elk Refuge had an average of 850,000 visitors annually during the 1992 through 2001 period, and just over 900,000 annual visitors from 1998 through 2002. A recent exit survey (RRC Associates 2005) of airline passengers indicated that 25% of the respondents visited the National Elk Refuge and/or participated in wildlife viewing. However, actual dollars generated from visitation to the refuge are minor relative to the total local economy. Summer and winter visitor surveys (Loomis and Caughlan 2004; Loomis and Koontz 2005) were conducted to estimate the economic impact of the refuge on the area economy. Surveys were conducted of winter sleigh riders and elk hunters. During the last several years, an annual average of about 25,000 visitors have participated annually in winter sleigh rides; more than 90% of these are estimated to be non-local visitors.

The results of the above surveys were entered into the IMPLAN input-output economic model to analyze the economic impact of visitor and hunter spending. Based on daily visitor expenditures, it was estimated that winter sleigh rides and elk hunting in the refuge generate approximately $2.25 million in annual visitor expenditures, $1.27 million in direct and indirect personal income, and 61 direct and indirect jobs in the Jackson area (Loomis and Caughlan 2004).

Ski Resorts

Table 25 portrays annual skier days for the three ski resorts in the Jackson area for the 1997 through 2004 period. As shown in the table, total annual skier days have remained relatively stable, ranging generally between 550,000 and 600,000 skier days per skiing season. In 2004, the Jackson Hole Mountain Resort had its highest number of skier days since 1999/2000, and accounted for 65% of the total skier days for the three ski resorts. All three ski resorts also have summer recreational activities. Surveys indicate that up to 90% of the skiers arrive in the Jackson area by air (Southern Teton Area Rapid Transit 1999; Jackson Hole Chamber of Commerce 2006).

TABLE 25: ANNUAL SKIER DAYS [a/]

Ski Areas	1997 [b/]	1998	1999	2000	2001	2002	2003	2004
Jackson Hole Mountain Resort	355,900	356,800	392,000	364,000	352,000	350,000	373,000	397,500
Grand Targhee Resort	114,500	116,900	137,000	132,000	131,000	150,900	135,900	155,000
Snow King Resort	81,200	67,400	61,000	55,000	52,000	50,000	52,000 [c/]	52,000 [c/]
Total	551,600	541,100	590,000	551,000	535,000	550,900	560,900	604,500

a/ Source: Jackson Hole Chamber of Commerce 2006. Skier day counts include the number of days skied by resident season pass holders, resident day skiers, and tourists.
b/ Date represents the starting year of ski season.
c/ Estimated.

Surveys of airline passengers as they were leaving through the Jackson Hole Airport were conducted in the winter of 2004/2005 (RRC Associates 2005). Survey results showed that:

- Eighty-one percent of the visitors participated in downhill skiing or snowboarding, while 27% participated in snowmobiling.
- Skier survey respondents skied an average of 4.2 days.
- Overall length of stay by visitors and non-locals in the Jackson area was 5.7 nights.
- The average per capita daily expenditure was $281, with a typical winter visitor spending $94 per day at the ski resorts and $187 for lodging, food/beverages, shopping, transportation, and other expenses in the Jackson area.

Based on the survey results from Dean Runyan Associates (2005), there were 76,987 non-local visitor enplaned passengers during the 2004/2005 winter season, and the typical length of their visit was 5.7 days. From this, it can be estimated that the impact of non-local visitor spending approximated $123 million. Approximately $90 million of visitor spending resulted from a 4.2-day length of stay, with an estimated $20 million expended at the ski resorts (RRC Associates 2005).

National Forests

The Bridger-Teton National Forest is adjacent to Grand Teton National Park on the east and south, and the Caribou-Targhee National Forest adjoins the park on the west. Visitors to the area also recreate in the Gallatin and Custer National Forests in Montana, Beaverhead-Deerlodge National Forest in Idaho, and Shoshone National Forest in Wyoming.

According to visitor use monitoring surveys, the top five activities cited by people visiting the area's national forests are viewing natural features and scenery, viewing wildlife, general relaxing, hiking or walking, and driving for pleasure on roads. Other popular activities include bicycling, developed camping, fishing, hunting, picnicking and family day use, water sports, and visiting resorts and cabins (Greater Yellowstone Coordinating Committee 2006).

While winter activities are increasingly contributing to the total recreation use of the area's national forests, more than 90% of recreation use still occurs between April and December (Greater Yellowstone Coordinating Committee 2006). Winter recreation primarily consists of downhill skiing on slopes within the national forest that are associated with developed resorts on adjoining private land. Outside the ski resorts, popular winter activities include snowmobiling, cross-country skiing, snowshoeing, and snow play.

Tourism/Recreational Economic Impacts

Table 26 portrays the direct annual travel impacts on Teton County, Wyoming during the 1997 through 2004 period as presented in *The Economic Impact of Travel in Wyoming, 1997-2004: Detailed State and County Estimates* (Dean Runyan Associates 2005). This study documented the economic significance of the travel industry in Wyoming and each of its counties. The Regional Travel Impact Model (RTIM) was used to analyze and estimate the direct economic impacts of travel at the state, regional, and county levels.

TABLE 26: ESTIMATED DIRECT TRAVEL IMPACTS, TETON COUNTY, WYOMING [a/]

Impact Category	1997	1998	1999	2000	2001	2002	2003	2004	Average Annual Change (percent)
Travel spending	$342.2 million	$368.4 million	$392.1 million	$411.5 million	$424.0 million	$434.2 million	$443.2 million	$470.8 million	4.7
Earnings generated [b/]	$105.0 million	$113.4 million	$121.3 million	$125.8 million	$130.0 million	$134.4 million	$139.1 million	$152.6 million	5.5
Tax receipts generated [c/]	$16.4 million	$17.7 million	$19.2 million	$20.0 million	$20.7 million	$21.2 million	$21.1 million	$22.1 million	0.4
Employment generated [d/]	$5,670 million	$5,790 million	$5,950 million	$5,840 million	$5,850 million	$5,820 million	$5,720 million	$5,990 million	0.8

a/ Source: Dean Runyan Associates 2005. All values are in current dollars, not adjusted for inflation.
b/ Earnings include wage and salary disbursements, earned benefits of employees, other earned income and proprietor income.
c/ Tax receipts include local lodging and sales taxes, one-third of state sales tax allocation, and state gasoline tax. Approximately 60% of the total tax receipts consist of tax receipts from locally levied sales taxes.
d/ Employment includes full-and part-time payroll employees and proprietors. Thus, employment estimates are not full-time equivalents.

Direct economic impacts represent the employment and earnings attributable to travel expenditures made directly by travelers at businesses in a county. In 2004, annual direct travel-related spending in

Teton County, Wyoming totaled more than $470 million, generated $153 million in annual income, and was responsible for employment of almost 6,000 people, representing 25% of the county's total employment (Dean Runyan Associates 2005). Accommodations and food/beverage services generally accounted for more than 50% of total visitor spending on commodities, and were responsible for 70% of the earnings and employment generated by travel spending. Overall direct travel spending and associated travel-related earnings generated increased at an approximate 5% annual rate during this period.

The IMPLAN economic model is used for estimating economic impacts on a local economy. This model is described later in this section under the heading "On-Airport Economic Impacts." The IMPLAN model was applied to the direct travel impacts reported by Dean Runyan Associates (2005) for Teton County, Wyoming to estimate indirect economic impacts. Indirect impacts, when added to direct impacts, result in total estimated economic impacts of travel on the county. Indirect impacts represent the:

- Employment and earnings associated with businesses that supply goods and services to the businesses directly impacted; and
- Employment and earnings that result from purchases for food, housing, transportation, recreation and other goods and services made by travel industry employees and other indirectly affected businesses.

The multipliers applied to each of the economic variables represent a recirculation of dollars in the local economy. Total economic impacts are estimated as follows:

- Travel spending (expenditures) = $470.8 million X 1.53 = $720.3 million total impacts.
- Earnings generated = $152.6 million X 1.53 = $233.5 million total impacts.
- Employment generated = $5,990 X 1.35 = $8,087 total impacts.

Table 27 presents an estimate of the total impacts of the travel industry in Teton County, Wyoming and Teton County, Idaho. The estimated impacts in from the alternatives that are provided later in this section are based on the data contained in the non-local visitor surveys that form the basis for estimating the economic impacts of the Jackson Hole Airport in the subsequent section. IMPLAN multipliers were applied to the direct impacts to estimate indirect impacts. As shown in the table, total impacts for the two-county area includes

- Travel spending (expenditures) of $775 million to $900 million total impacts.
- Earnings generated of $400 million to $525 million total impacts.
- Employment generated of $10,125 to $13,500 total impacts.

JACKSON HOLE AIRPORT

The Jackson Hole Airport is the base for 52 aircraft, which includes 36 single-engine airplanes, 3 multi-engine airplanes, 11 jets, and 2 gliders (AirNav, LLC 2008). In addition to general aviation, several scheduled passenger service airlines serve the airport with daily and/or weekend departing and arriving flights. On-airport services include scheduled passenger service and general aviation flights, aviation fueling, aircraft maintenance, aircraft rental, car rental, and charter flights. Jackson Hole Aviation is the onsite fixed-base operator.

**TABLE 27: ESTIMATED TRAVEL IMPACTS,
TETON COUNTY, WYOMING AND TETON COUNTY, IDAHO 2005**

Economic Variable	Economic Impacts
Expenditures	
Direct [a/]	$520 million to $600 million
Indirect [b/]	$265 million to $300 million
Total	$775 million to $900 million
Employment	
Direct [c/]	7,500 to 10,000
Indirect [d/]	2,625 to 3,500
Total	10,125 to 13,500
Income (earnings)	
Direct [e/]	$300 million to $400 million
Indirect [f/]	$105 million to $125 million
Total	$400 million to $525 million

a/ Estimated. Includes non-local visitor expenditures for goods and services.
b/ An IMPLAN expenditure multiplier of 1.53 was used to estimate indirect expenditures generated by non-local visitor direct expenditures.
c/ Represents direct employment generated by non-local visitors.
d/ An IMPLAN employment multiplier of 1.35 was used to estimate indirect employment generated by direct employment.
e/ Represents direct income (earnings) generated by non-local visitors. Wage/salary of other on-airport employees was estimated based on industry sector employment and average wage/salary for that employment sector.
f/ An IMPLAN earnings multiplier of 1.53 was used to estimated indirect earnings generated by direct earnings (wages/salaries of on-airport employees).

Flight Operations

Table 18 in the "Park and Airport Operations" section provides operations at the Jackson Hole Airport for 2000 through 2009. In 2001 there were 40,716 aircraft operations at this facility, but the number has declined since then to 29,003 in 2009.

Employment

There are about 485 full-time-equivalent people employed in on-airport capacities. These people provide administration, airport terminal services, security screening, rental car services, concession services, aircraft maintenance, aircraft services, fixed-base operations, and line service. Employment includes full-time, part-time, and seasonal positions. Construction-related employment associated with periodic facility construction, improvement, and/or repair is not included in this total.

Airport Funding

Funding for Jackson Hole Airport operations is from airport operating revenues. Capital improvements primarily are federally funded.

Operating Revenues. Airport operating revenues are from a number of sources, including scheduled passenger service airline landing fees and ramp rents, general aviation landing fees, hangar rents, on-airport parking, on- and off-airport rental car rents, other rents such as terminal space for the restaurant, operational fees of the fixed-base operator, and gas tax refunds. Scheduled passenger service is directly or indirectly responsible for 90% or more of the airport's total annual operating income.

- In fiscal year 2004/2005, the Jackson Hole Airport received approximately $700,000 in scheduled passenger service landing fees and ramp rents. Other operating income directly associated with scheduled passenger service approximated $250,000.
- Other airport operating revenues indirectly result from scheduled passenger service. For example, rental car rent income approximates $1.4 million annually. Most rental car use is by commercial airline passengers.

In contrast, operating income from general aviation landing fees was only about $139,000.

In fiscal year 2004/2005, operating revenues totaled $3.67 million, an approximate 75% increase since fiscal year 1995/1996. Operating expenditures in fiscal year 2004/2005 totaled $3.06 million, resulting in a surplus of $614,000 for the fiscal year. Over the last 10 years, surpluses have averaged $590,000 annually.

Annual payrolls account for approximately 40% of the airport's annual operating expenses.

In addition to other annual operating revenues, the Jackson Hole Airport Board began receiving Transportation Security Administration funds in fiscal year 2002/2003 to provide security screening. Whenever yearly security screening income exceeds screening expenses, the surplus funds can be used for capital improvements.

As indicated in Table 28, annual operating income has exceeded operating expenditures each year, with the annual surplus ranging from $300,000 in 2001/2002 to $740,000 in 1998/1999. The 1983 agreement specifies annual payments from the Jackson Hole Airport Board to the U.S. Department of Interior equal to the sum of 1% of the first $200,000 of operating receipts (excluding grants and revolving funds), and 1.5% of operating receipts exceeding $200,000. Payments to the U.S. Department of Interior have ranged between $30,000 and $50,000 annually, with payments totaling $371,000 over the last 10 years.

TABLE 28: JACKSON HOLE AIRPORT OPERATING INCOME/EXPENDITURES, FISCAL YEAR 1995/1996 THROUGH FISCAL YEAR 2004/2005 [a/]

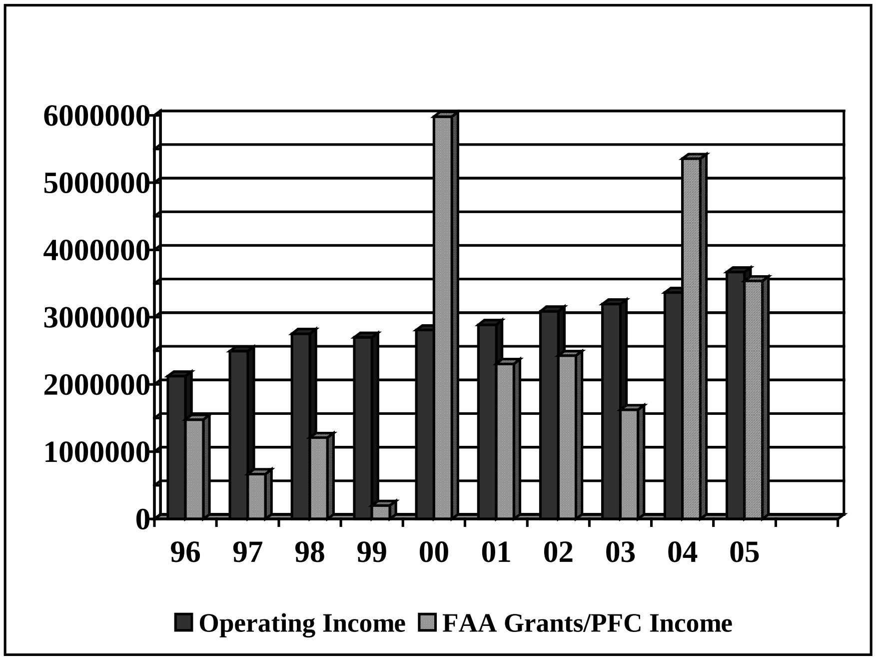
	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05
Operating income	$2.12 million	$2.49 million	$2.75 million	$2.70 million	$2.81 million	$2.89 million	$3.10 million	$3.29 million	$3.37 million	$3.67 million
Operating expenses	$1.70 million	$1.76 million	$2.02 million	$1.96 million	$2.12 million	$2.46 million	$2.80 million	$2.46 million	$2.99 million	$3.06 million
Surplus	$0.42 million	$0.73 million	$0.73 million	$0.74 million	$0.69 million	$0.43 million	$0.30 million	$0.83 million	$0.38 million	$0.61 million

a/ Source: Unpublished Jackson Hole Airport financial statements.

Capital Improvements Funds. Federal funding for capital improvements consists of Federal Aviation Administration grant funds under the Airport Improvement Program, and the Federal Aviation Administration-approved passenger facility charges. Figure 12 portrays the distribution of the airport's annual income from operating revenues and combined Federal Aviation Administration grants and passenger facility charge income for 1996 through 2005. While operating income is fairly steady, federal monies fluctuate considerably, based on specific projects that were funded. For example:

FIGURE 12: JACKSON HOLE AIRPORT ANNUAL FUNDING, FISCAL YEARS ENDING 1995 THROUGH 2005

Source: Jackson Hole Airport.



- In fiscal year 2004/2005, Federal Aviation Administration grants and passenger facility charge income totaled more than $3.5 million, or just under 50% of the airport's annual income.
- The federal funding of nearly $6 million in 2000 represented more than two-thirds of annual income.
- Federal funding of less than $500,000 in 1999 was less than 20% of annual airport income.

The Airport Improvement Program provides grants to public agencies for the planning and development of public-use airports that are included in the National Plan of Integrated Airport Systems (NPIAS). The passenger facility charge is derived from federally approved charges on passenger tickets to and from the Jackson Hole Airport. Because passenger facility charge funds are tied to the Airport Improvement Program, a loss of Federal Aviation Administration funding would also result in the loss of eligibility for passenger facility charges funds.

The Airport Improvement Program grant funds are classified as "entitlement" based on passenger numbers, or "discretionary," which is based on project priority and need. Because the Jackson Hole Airport is classified as a small primary or general aviation airport, grants cover 95% of eligible project costs. Eligible projects include those improvements relating to enhancing airport safety, capacity, security, and environmental concerns. Generally, airports can use Airport Improvement Program funds on most airfield capital improvements or repairs, except those for hangars, parking lots, and non-aviation development. Projects related to airport operations and revenue generating improvements are typically not eligible for funding.

Most infrastructure of the Jackson Hole Airport, including all "airside" infrastructure, is maintained and improved with federal funds. Between 1995 and 2005, almost $28 million in projects were federally funded at the Jackson Hole Airport using $14 million in entitlement funding, $7 million in discretionary funding, and almost $7 million from passenger facility charges.

This represented 46% of the airport's total income from operations and Federal Aviation Administration grant / passenger facility charge funds during this 10-year period. More than $14 million of this amount consisted of Airport Improvement Program entitlement funding, with the remainder consisting of Airport Improvement Program discretionary and passenger facility charge funding. Most of the federal funds were spent on apron construction and expansion, runway safety zones, modifications of the terminal building, security enhancements in the terminal, construction of an air traffic control tower, acquisition of snowplows and fire trucks, and installation of airport fencing.

On-Airport Economic Impacts

The IMPLAN economic model is used for estimating the economic impacts on local economies. The model uses an internally derived database to estimate impacts on major economic variables, such as employment, income, and expenditures. The model is based on an input-output accounting system that calculates commodity flows from producers to intermediate and final consumers. Purchases for final use (final demand) drive the model. Impacts are categorized as direct, indirect, or induced. The model calculates a set of multipliers to estimate indirect and induced impacts as a result of the changing of dollars from the original to the final consumer.

For estimating on-airport impacts for the Jackson Hole Airport, direct impacts include only those jobs, income, and sales expenditures generated by on-airport employees. Indirect impacts represent jobs, income, and sales generation that would not occur in the absence of the airport, but that originate from off-airport activities still attributable to the airport and its employees. Indirect economic impacts are the recycling of dollars as a result of the direct impacts and are reflected as an industry "multiplier." On-airport economic impacts do not include the economic impacts of tourism in respect to expenditures, income, and employment generated off-airport. These off-airport impacts are discussed in the subsequent section.

Table 29 portrays the estimated on-airport annual economic impacts of the Jackson Hole Airport on the local economy. These impacts reflect both direct and indirect impacts of on-airport operations on employment, earnings (income), and expenditures for goods and services by the on-airport employees. The IMPLAN multipliers, used in previous economic studies for the Jackson area and the Jackson Hole Airport, provided consistency in estimating the indirect impacts on employment, earnings, and expenditures.

As reflected in Table 29, the estimated total annual economic impact of on-airport operations include expenditures for goods and services by on-airport employees of $10 million to $15 million; 470 to 540 jobs; and $12.5 million to $16.6 million in earnings. Employment, expenditures, and earnings result from on-airport operations only, and do not include off-airport non-local visitor generated spending, earnings, and employment.

In addition to the above impacts from annual operations, there have been impacts from construction and expansion of on-airport facilities. The construction projects also generate employment, earnings, and additional expenditures for goods and services. Applying the Economic Impact Forecast System model and the IMPLAN multipliers, on-airport construction projects during the 1995 through 2005 period directly and indirectly generated an estimated annual average of 20 to 25 jobs, $0.54 million in annual income, and $2.5 million in annual business sales.

TABLE 29: ESTIMATED ON-AIRPORT ANNUAL OPERATIONAL ECONOMIC IMPACTS

Economic Variable	Economic Impacts
Expenditures	
Direct [a/]	$7 million to $10 million
Indirect [b/]	$3 million to $5 million
Total	$10 million to $15 million
Employment	
Direct [c/]	350 to 400
Indirect [d/]	120 to 140
Total	470 to 540
Income (earnings)	
Direct [e/]	$8.5 million to $10.5 million
Indirect [f/]	$4.0 million to $6.0 million
Total	$12.5 million to $16.5 million

a/ Estimated. Includes expenses for consumer goods and services by on-airport employees.
b/ An IMPLAN expenditure multiplier of 1.53 was used to estimate indirect expenditures generated by on-airport direct expenditures by airport employees.
c/ Jackson Hole Airport personnel estimate total on-airport employment between 350-400.
d/ An IMPLAN employment multiplier of 1.35 was used to estimate indirect employment generated by on-airport direct employment.
e/ The Jackson Hole Airport's annual payroll for its employees was used to estimate annual wage/salary of the airport's payroll employees. Average annual wage/salary of other on-airport employees was estimated based on industry sector employment and average wage/salary for that employment sector.
f/ An IMPLAN earnings multiplier of 153 was used to estimated indirect earnings generated by direct on-airport earnings (wages/salaries of on-airport employees).

Off-Airport Economic Impacts

The Jackson Hole Airport accounts for 74% of all scheduled passenger service enplanements in Wyoming (Bishop 2008). Annual scheduled passenger service enplanements at the Jackson Hole Airport from the mid-1990s through 2008 were presented previously in Table 17 in the "Park and Airport Operations" section and are shown graphically on Figure 13. Since 1996, annual enplanements have increased from about 180,000 to more than 311,000 in 2008. However, as shown in the table and figure, the growth has not been steady, with increases in enplanements in some years and decreases in others.

The IMPLAN economic model was used to estimate the total off-airport impacts on the local economy. Direct off-airport impacts represent the expenditures, earnings, and employment directly attributable to non-local visitors who arrived by air transportation in the Jackson area. Indirect impacts represent the secondary expenditures, earnings, and employment generated by the initial direct impacts of non-local visitors (for example, businesses that supply goods and services to the businesses that were directly impacted). The induced impacts, which are included in the indirect impacts, represent the employment and earnings that result from purchases for food, housing, transportation, recreation, and other goods and services made by the employees of the other tertiary indirectly affected businesses.

FIGURE 13: JACKSON HOLE AIRPORT ANNUAL
SCHEDULED PASSENGER SERVICE ENPLANEMENTS 1996 THROUGH 2009
Source: Jackson Hole Airport.

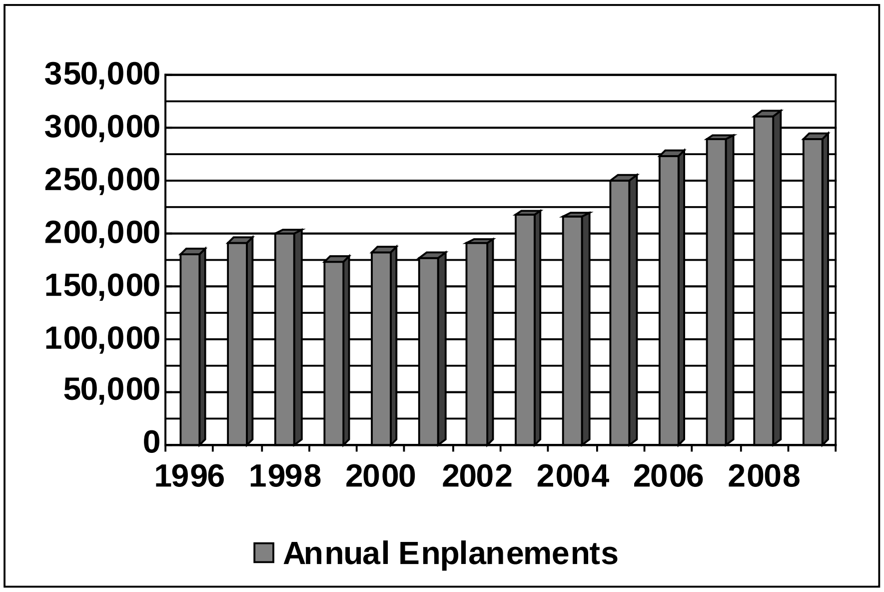


Table 30 portrays the estimated off-airport annual economic impacts of the Jackson Hole Airport on the local economy. These impacts reflect off-airport direct and indirect annual impacts on employment, non-local visitor expenditures for goods and services, and earnings (income). The IMPLAN multipliers, used in previous economic studies for Teton County and the Jackson Hole Airport, provided consistency in estimating the indirect impacts on employment, expenditures, and earnings.

TABLE 30: ESTIMATED OFF-AIRPORT ANNUAL ECONOMIC IMPACTS

Economic Variable	Economic Impacts
Expenditures	
Direct	\$250 million to \$275 million
Indirect [a/]	\$130 million to \$145 million
Total	\$380 million to \$420 million
Employment	
Direct	4,300 to 4,700
Indirect [b/]	1,500 to 1,600
Total	5,800 to 6,300
Income (earnings)	
Direct	\$97 million to \$106 million
Indirect [c/]	\$50 million to \$56 million
Total	\$147 million to \$162 million

a/ An IMPLAN expenditure multiplier of 1.53 was used to estimate indirect expenditures generated by direct expenditures.
b/ An IMPLAN employment multiplier of 1.35 was used to estimate indirect employment generated by direct employment.
c/ An IMPLAN earnings multiplier of 1.53 was used to estimate indirect earnings generated by direct earnings (wages/salaries of on-airport employees).

Non-local visitor survey data collected previously (Loomis & Caughlan 2004; RRC Associates 2005) were used as the basis for the analysis. Data used included number of seasonal and annual enplanements, seasonal and annual recreational visits, visitor expenditures per day, and average length of stay. Survey results varied and, thus, a range of estimated economic impacts was used for each economic variable.

Expenditures, employment and income were calculated separately for the summer and winter seasons, with the additional impacts from the four "shoulder" months pro-rated based on the summer season. All of these were summed to calculate the annual total.

Previous surveys indicated that between 6% and 12% of non-local summer visitors arrive by air. The estimates for economic impacts were based on the assumption that 10% of summer non-local visitors arrive by air, and that 90% of winter non-local visitors arrive by air. Length of visitor stay and daily expenditures per person from the previous surveys were inputs into the calculations of the estimates.

The off-airport economic impacts presented in Table 30 reflect impacts directly and indirectly attributable to non-local visitors. Impacts resulting from general aviation operations are not included in these estimates. As shown in the table, off-airport direct economic impacts include annual visitor expenditures of $250 to $275 million, $97 million to $106 million in local earnings, and 4,300 to 4,700 jobs. Total annual economic impacts, including indirect and induced impacts, are estimated at $380 million to $420 million in expenditures, 5,800 to 6,300 jobs, and $147 million to $162 million in local income. These impacts reflect those jobs generated directly and indirectly in the local business sectors, direct and indirect expenditures for goods and services by tourists and businesses, and income of those employees directly and indirectly employed in the business sectors impacted by tourism. There will be some leakage of the indirect and induced expenditures, employment, and earnings outside the local area because the source is external to Teton County. It is estimated that 35% to 40% of the total economic impact of non-local visitors and tourism is the direct result of air transportation to and from the Jackson Hole Airport.

Total estimated off-airport and on-airport economic impacts are shown in Table 31. Total estimated direct and indirect, on-airport and off-airport impacts include $390 million to $435 million generated in non-local visitor expenditures, creation of 6,270 to 6,840 jobs; and $159.5 million to $178.5 million in local income (earnings). The economic impacts resulting directly and indirectly from the Jackson Hole Airport probably account for 25% to 30% of the local economy.

In a report titled *2004 Wyoming Economic Impacts of Aviation* (Wyoming Department of Transportation 2004), it was estimated that the Jackson Hole Airport has the greatest impact on business sales and employment of all the airports in Wyoming. The report used the IMPLAN economic model, which estimated a total of 7,185 direct and indirect jobs created; and almost $300 million in business sales generated by scheduled passenger service aviation at the Jackson Hole Airport. In addition, total annual expenditures of general aviation visitors who arrive through the Jackson Hole Airport were estimated at $12.5 million with an estimated 10,865 annual visitors.

TABLE 31: ESTIMATED TOTAL AIRPORT ANNUAL ECONOMIC IMPACTS

Economic Variable	Economic Impacts
Expenditures	
Direct	$257 million to $285 million
Indirect [a/]	$133 million to $150 million
Total	$390 million to $435 million
Employment	
Direct	4,650 to 5,100
Indirect [b/]	1,620 to 1,740
Total	6,270 to 6,840
Income (earnings)	
Direct	$ 105.5 million to $116.5 million
Indirect [c/]	$54.0 million to $62.0 million
Total	$ 159.5 million to $178.5 million

a/ An IMPLAN expenditure multiplier of 1.53 was used to estimate indirect expenditures generated by direct expenditures.
b/ An IMPLAN employment multiplier of 1.35 was used to estimate indirect employment generated by direct employment.
c/ An IMPLAN earnings multiplier of 1.53 was used to estimate indirect earnings generated by direct earnings (wages/salaries of on-airport employees).

SURFACE AND AIR TRANSPORTATION

AIR TRANSPORTATION

Elements of the existing environment with regard to transportation by air, including current use of the airport to access the area, scheduled passenger service, and general aviation use, were described previously in this environmental impact statement in:

- "Current Use of the Jackson Hole Airport and Other Airports in the Region" in Chapter 1; and
- "Park and Airport Operations," which was included earlier in this Chapter 3.

Forecasts of future airport use were included in the "Park and Airport Operations" section under the heading "Jackson Hole Airport Operations." Air-related medical evacuation services were considered under "Public Health and Safety."

PUBLIC OR COMMERCIAL TRANSIT

Bus service in the Jackson area is provided by Southern Teton Area Rapid Transit, or "START." The START system is funded partially by the Town of Jackson, Teton County, and the federal government.

START was first implemented in 1987 to provide transportation between Jackson and Teton Village. Other routes now include a 12-mile-long town shuttle, and commuter routes that transport workers from other communities in the morning and take them home in the evening. Service includes commuter routes to Jackson from:

- Star Valley on U.S. Highway 89, which includes a stop in Alpine.
- Driggs, Idaho over Teton Pass on Wyoming Highway 22 and Idaho Highways 33 and 31, which includes a stop in Victor, Idaho.

The START system does not currently include service to the Jackson Hole Airport. However, it has evaluated the potential for this route in the past (Town of Jackson and Teton County 2003). Public interest has increased recently because of higher fuel prices and increased awareness of global warming, and talks began recently about providing START service to the airport.

Nineteen taxi companies, six limousine services, and one shuttle company provide ground transportation service to the airport. The one-way taxi rate from the airport to Jackson for one or two people is $27 and the rate to Teton Village is $47. The one-way shuttle service costs $15 for a one-way trip to Jackson and $22 for a one-way trip to Teton Village.

ROADS THAT COULD BE AFFECTED BY THE ALTERNATIVES

Roads in Grand Teton National Park

The primary surface route through the park between Jackson and the airport is U.S. Highway 26/89/191. The methods used by the National Park Service to determine visitation at Grand Teton

National Park are described on the Internet at <http://www2.nature.nps.gov/stats/pdf/grteci1992.pdf>. Inductive loop traffic counters record the numbers of vehicles. In the June-through-August period, a multiplier of 2.7 people per vehicle is applied. The multiplier used for the remainder of the year is 2.4 people per vehicle.

July is the heaviest use month at Grand Teton National Park, with combined recreational and non-recreational visitation in 2005 of approximately of 758,500 people (NPS 2005a), or about 24,500 people making 9,060 vehicle trips per day. This also was the busiest month in 2005 for enplanements at the Jackson Hole Airport, with 36,176 enplanements (Jackson Hole Airport Board 2006c), or about 1,170 people per day.

It is assumed here that:

- Airport arrivals equal departures (enplanements).
- Most passengers arriving through the airport travel from the site by automobiles. These could be rentals, personal vehicles parked at the airport, or pickup by another driver, including a taxi.
- They have the same vehicle occupancy rate as park visitors.

Airport-passenger-related traffic on a typical July 2005 day represented approximately 868 vehicle trips (434 by arriving passengers and 434 by departing passengers) and 9.6% of the traffic in Grand Teton National Park.

March is the month with the greatest traffic contribution by the airport relative to the amount of traffic in the park. Total park visitation in March 2005 was 161,433 people, or about 5,200 people making about 2,170 vehicle trips per day. In that month, there were 26,994 enplanements (871 people per day) from the Jackson Hole Airport. Airport-passenger-related traffic in March 2005 represented approximately 726 vehicle trips and 33.5% of the traffic in Grand Teton National Park.

On-airport employment totals about 485 people. If all used their own vehicles to commute to and from work, they would generate 970 vehicle trips daily. If they car-pooled at the same rate as visitors outside the summer season (2.4 people per vehicle), airport employees would generate about 400 vehicle trips per day. A middle number of about 700 vehicle trips per day is most likely. Using this value, automobile trips by airport employees represented 7.5% of the total recreational and non-recreational park traffic in July 2005 and 32% of total park traffic in March 2005.

When vehicle trips by airport passengers and airport employees are summed, airport-related traffic probably accounted for about:

- One-sixth of the traffic in Grand Teton National Park on a typical July 2005 day.
- Two-thirds of the traffic in the park on a typical March 2005 day.

Roads outside Grand Teton National Park

Traffic counts for roads outside Grand Teton National Park that could be affected by agreement alternatives for the Jackson Hole Airport were obtained from the Wyoming Department of Transportation and Idaho Transportation Department. All of these routes are included in Figure 1 in Chapter 1. Table 32 presents the year 2004 average daily traffic counts for these roads, arranged from east to west for common routes. As shown in the table:

TABLE 32: AVERAGE DAILY TRAFFIC COUNTS FOR SELECTED ROADS IN WYOMING AND IDAHO, 2004

Road	Average Daily Traffic
Wyoming Highway 22 east of Wyoming Highway 390, Wyoming	15,374 [a/]
Wyoming Highway 22 west of Wilson, Wyoming	4,344 [a/]
Wyoming Highway 22 at Targhee National Forest, Wyoming	4,150 [b/]
Idaho Highway 33 at Wyoming state line, Idaho	4,100 [c/]
U.S. Highway 26 Alpine Junction, Wyoming to state line	1,740 [b/]
U.S. Highway 26 state line to Palisades, Idaho	1,600 [c/]
U.S. Highway 26, Palisades, Idaho to Swan Valley, Idaho	2,300 [c/]
U.S. Highway 26, Swan Valley, Idaho to Idaho Falls, Idaho	3,500 [c/]
Idaho Highway 31, Victor, Idaho to Swan Valley, Idaho	1,800 [c/]

a/ Source: Calculated from Wyoming Department of Transportation 2005
b/ Source: Thomas 2006
c/ Source: Idaho Transportation Department 2005

- Close to Jackson, Wyoming Highway 22 supports more than 15,000 average daily traffic trips. West of Wilson, traffic decreases by more than two-thirds. At the state line, the daily count is about 4,150 vehicles.
- U.S. Highway 26 at the state boundary carries about 1,700 vehicles per day. The traffic count increases to 3,500 vehicles per day east of Swan Valley as this highway approaches the city of Idaho Falls.
- Idaho Highway 31, which is an important connector between Idaho Highway 33 at Victor and U.S. Highway 26 at Swan Valley, carries 1,800 vehicles per day.
- Wyoming Highway 22 west of Jackson is the busiest two-lane highway in the state.

Information regarding traffic patterns and traffic planning on Wyoming highways was obtained from District 3 of the Wyoming Department of Transportation. According to Thomas (2006):

- Wyoming Highway 22 shows strong traffic peaks in the morning and evening. The peaks are associated with commuter traffic between more affordable housing in the vicinity of Driggs and Victor, Idaho, and jobs in the Jackson area.
- The Wyoming Department of Transportation recently completed a safety upgrade of Wyoming Highway 22 over Teton Pass. This included installing new areas of guardrails, and applying a 2-inch overlay of asphalt on the road surface.
- An upgrade of Wyoming Highway 22 from Wilson to Jackson is planned for the year 2012. Except for ongoing maintenance, there are no other plans for modifying this highway.
- The rule of thumb used by District 3 of the Wyoming Department of Transportation is that a two-lane road like Wyoming Highway 22 can handle an annual average daily traffic count of 5,000 vehicles and maintain an acceptable level of service rating of "C." (As shown by the data in Table 32, annual average daily traffic levels on all of the highways except in the immediate vicinity of Jackson are below this threshold.)
- Despite an annual average that is below the threshold, existing traffic on the Teton Pass stretch of Wyoming Highway 22 routinely exceeds 5,000 vehicles per day on weekdays throughout June,

July, August, and September. Published Wyoming Department of Transportation (2005) data show that during July 2004, the average weekday traffic count on this stretch was 6,460 vehicles. Any failure effectively closes down the highway, and even basic maintenance will cause a traffic backup of a couple of miles or more.

- The “ballpark” cost for upgrading the steepest 7 or 8 miles of Wyoming Highway 22 probably would be similar to the cost of about $13 million per mile that was required by the Colorado Department of Transportation (Wilson 2006) to upgrade the very similar U.S. Highway 40 over Berthoud Pass to a four-lane highway. In flatter areas close to Jackson, the construction costs for upgrading to a four-lane highway probably would be $1 million to $2 million per mile. However, right-of-way acquisition costs in this area would be very high.
- Relatively few commuters use U.S. Highway 26 west of Jackson, so traffic is more evenly distributed throughout the day than on Wyoming Highway 22. With an average daily traffic count of fewer than 2,000 vehicles, there are no plans to upgrade this highway to add capacity.

District 6 of the Idaho Transportation Department, provided the following characterization of highways in Idaho that could experience changes in traffic, based on the different alternatives for extending the Jackson Hole Airport agreement (Cole 2006):

- Idaho Highway 33 (which changes to Wyoming Highway 22 at the state line) experiences the same morning and evening commuting-related traffic spikes that were described by Thomas.
- No upgrades are planned for Idaho Highway 33 between Victor and the Wyoming state line.
- This highway needs fairly significant improvements, such as passing opportunities in areas where recreational vehicles labor up the grades. However, because of limited funding, there is no expectation that this will occur in the foreseeable future. The primary environmental constraints along Idaho Highway 33 are related to the protection of the area’s extensive wetlands, and would result in upgrade costs in the vicinity of $2 million per mile for the 6-mile stretch from Victor to the Wyoming state line.
- U.S. Highway 26 from Idaho Falls east to Swan Valley is in relatively good condition with plenty of passing opportunities. Passing areas are more limited between Swan Valley and the Wyoming state line, but still are considered adequate. Based on existing traffic projections, the Idaho Transportation Department does not foresee any need to upgrade either of these highway stretches.
- Most people traveling between Idaho Falls and Jackson take U.S. Highway 26 from Idaho Falls to Swan Valley and then turn north on Idaho Highway 31 and get on Highway 33 at Victor. This route to Jackson is almost 20 miles shorter (45 miles versus 64 miles) than staying on U.S. Highway 26 for the entire trip.
- The 21-mile-long Idaho Highway 31 from Swan Valley to Victor is very winding and narrow. There are no current plans to upgrade this highway, but a capacity increase probably would cost about $10 million per mile for about two-thirds of its length. The remaining third probably could be upgraded for $2 million to $3 million per mile.
- Their rule of thumb for a single lane in one direction is that more than 1,700 vehicles per design hour will result in congestion. However, this is more applicable to urban areas than the rural and mountain setting west of Grand Teton National Park. In the areas that could be affected by this project, traffic planning focuses primarily on passing lanes and safety issues.

TRANSPORTATION PLANNING

The future plans for upgrades on Wyoming Highway 22, U.S. Highway 26, Idaho Highway 33, and Idaho Highway 31 in the vicinity of Grand Teton National Park were described previously.

The *Transit Development Plan, 2003 Update, Southern Teton Area Rapid Transit* (Town of Jackson and Teton County 2003) describes the existing transit system, establishes transit goals, presents existing use data, identifies alternatives for expanded and improved transit service, analyzes capital needs, outlines a five-year program and budget, examines sources of revenue and funding, and presents a marketing plan. A five-year plan update is prepared each year as part of the annual Southern Teton Area Rapid Transit (START) budget process.

The National Park Service recently completed a transportation plan for Grand Teton National Park (NPS 2006b). As a part of this plan, a transit study is being finalized that will determine the need for and feasibility of a transit system that would service Grand Teton National Park. Transit services may be provided in partnership with START. The airport could be a potential transit service location, but demand for the service beyond 2015 would likely be very different under Alternative 1 than it would be under Alternative 2.

Chapter 4
Environmental Consequences

INTRODUCTION

The National Environmental Policy Act mandates that environmental impact statements disclose the impacts of a proposed federal action. In this case, the proposed federal action is extending the 1983 agreement for Jackson Hole Airport for two 10-year terms, from 2033 to 2053.

This chapter analyzes the potential effects of an alternative for extending the 1983 agreement (Alternative 2), plus the no action alternative (Alternative 1). Effects were considered for each of the impact topics that were identified as retained in Table 3.

The chapter first describes the methods used to analyze impacts of the alternatives, including the general evaluation method and methods used to determine cumulative impacts. Then, for each impact topic, the analysis describes the:

- Applicable regulations and policies, expressed as desired conditions.
- Specific methods used to evaluate the impact topic. These include the:
  - Impact thresholds for intensity and duration of impacts;
  - Geographic area considered for the impact topic; and
  - Issues that were identified during scoping.
- Effects of each alternative relative to the issues identified during scoping. Each analysis includes a determination of cumulative impacts and a summary of conclusions.

An evaluation of impairment is presented after the detailed analysis of the impacts of each alternative for those impact topics that are subject to the requirements of non-impairment by the Organic Act. This evaluation is based on guidance provided in sections 1.4.7 and 8.2 of *Management Policies 2006* (NPS 2006a). An evaluation of unacceptable impacts and impairment by alternative is provided at the end of Chapter 4. There is also an evaluation of the effects of the alternatives with regard to sustainability and long-term management. This includes the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity, irreversible and irretrievable commitments of resources, and unavoidable adverse impacts.

METHODS FOR ANALYZING IMPACTS

GENERAL ANALYSIS METHOD

The National Park Service based impact analyses and conclusions on data from existing literature, information and insights provided by NPS and other agency experts, and professional judgment.

For each impact topic, a brief description of relevant components of the existing condition is provided. This information is then used as a basis for determining the effects of implementing each alternative. The impact analyses involved the following steps.

- Define issues of concern, based on internal and public scoping.
- Identify the geographic area that could be affected.
- Define the resources within that area that could be affected.
- Impose the alternative on the resources within the geographic area of potential effect.
- Identify the effects caused by the alternative, in comparison to Alternative 1, No Action, to determine the relative change. Characterize the effects based on the following factors:
  - Whether the effect would be beneficial or adverse.
  - The intensity of the effect, as negligible, minor, moderate, or major.
  - Duration of the effect, either short-term or long-term. Impact-topic-specific thresholds for each of these durations are provided in each impact topic methods section.
  - The area affected by the alternative, such as the area within the airport boundary, within the park boundary, or within Teton County.
  - Whether the effect would be a direct result of the action or would occur indirectly because of a change to another resource or impact topic. An example of an indirect impact would be increased mortality of an aquatic species that would occur because an alternative would increase soil erosion, which would reduce water quality.
- Determine whether unacceptable impacts or impairment could occur to resources and values considered necessary and appropriate to fulfill the purposes of Grand Teton National Park.
- Determine cumulative effects by evaluating the effect in conjunction with past, present, or reasonably foreseeable future actions for Grand Teton National Park and the region.

Impact Topic Thresholds

The impact-topic-specific thresholds that were used to define the intensity of effects are provided in each impact topic methods section. Threshold values were developed based on the guidance in sections 4.5.G.4. and 4.5.G.5. of *Director's Order #12 and Handbook: Conservation Planning, Environmental Impact Analysis, and Decision Making* (NPS 2001a). The goal was to apply thresholds that were accurate, scientifically credible, quantified as much as possible, and understandable to a lay readership.

The National Park Service does not have standardized impact thresholds for National Environmental Policy Act documents. Instead, it uses the guidance outlined in Director's Order #12 to develop park- and project-specific impact thresholds, taking into consideration existing conditions within that park, the type of action proposed, and the context, intensity, duration, and timing of potential impacts. All of the impact thresholds for every impact topic evaluated in this environmental impact statement were developed using this park- and project-specific approach.

In evaluating the intensity of effects on each impact topic, the National Park Service characterizes those effects as negligible, minor, moderate, or major. The National Park Service defines "measurable" effects as moderate or greater impacts. It equates "no measurable effect" with minor or lesser impacts. "No measurable effect" is used by the National Park Service in determining if a categorical exclusion applies or if impact topics may be dismissed from further evaluation in an environmental assessment or environmental impact statement. This approach concentrates the effort on issues that are truly significant to the action in question, rather than amassing needless detail, and conforms with section 1500.1(b) of the Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act.

The National Park Service equates the term "major" effects (or impacts) to the term "significant" as used in the National Environmental Policy Act and its implementing regulations. It thus distinguishes between proposed actions and their associated effects that would require the preparation of an environmental impact statement, versus those that may require only preparation of an environmental assessment and finding of no significant impact. The term major, by itself, does not, and is not intended to have, a specific meaning in the context of the NPS Organic Act. Specifically, the term "major" does not by itself indicate an impact that rises to the level of impairment or that is "unacceptable" as described in *Management Policies 2006* (NPS 2006a). However, effects that are determined to be "major" are always evaluated as to whether they are unacceptable or rise to the level of impairment.

Analyses by Time Period

This environmental impact statement evaluated actions between now and late 2033, which would include closure and removal of the airport in Alternative 1. Within this analysis period, the following comparisons were made.

- For the period from now until 2015, Alternative 2 was compared to the Alternative 1 transition between current airport operations and a general aviation facility.
- From 2015 until 2033, Alternative 2 was compared to an airport that was used exclusively for general aviation under Alternative 1.

Projections for airport use, expressed as numbers of aircraft operations and associated impacts for each alternative, were made for the years 2015 and 2025. The earlier date reflected conditions that would occur shortly after the start of the general aviation period. The later date estimated the maximum use levels that likely would occur under Alternative 1, before the deterioration of key airport facilities led some pilots to avoid the airport because they considered it unsafe.

UNACCEPTABLE IMPACTS AND IMPAIRMENT ANALYSIS METHOD

As described in Chapter 1, the National Park Service must prevent any activities that would impair park resources and values. The impact threshold at which impairment occurs is not always readily apparent. Therefore, the National Park Service applies a standard that offers greater assurance that impairment will not occur. This involves avoiding impacts that the National Park Service determines to be unacceptable; that is, they fall short of impairment, but are still not acceptable within a particular park's environment. Because park managers cannot allow uses that would cause unacceptable impacts, they must evaluate existing or proposed uses and determine whether the associated impacts on park resources and values are acceptable. By preventing unacceptable impacts, park managers ensure that the proposed use of park resource will not conflict with the conservation of those resources. In this manner, park managers ensure compliance with the Organic Act's separate mandate to conserve park resources and values.

An evaluation by alternative of unacceptable impacts and impairment is presented at the end of this chapter. An impairment determination also is made for individual impact topics that are subject to the requirements of non-impairment by the Organic Act.

CUMULATIVE EFFECTS ANALYSIS METHOD

The Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act require the assessment of cumulative impacts in the decision-making process for federal actions. Cumulative impact "is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (Title 40, *Code of Federal Regulations,* Part 1508.7). Cumulative impacts were considered for both the no action and action alternatives.

Cumulative impacts were determined by combining the impacts of each alternative with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other past, ongoing, and reasonably foreseeable future actions within Grand Teton National Park and in the surrounding region. Other actions that have the potential to have a cumulative effect in conjunction with alternatives for extending the 1983 agreement for the Jackson Hole Airport were identified in "Chapter 1, Purpose and Need for Action" under the heading "Connected, Cumulative, and Similar Actions."

ALTERNATIVE 1

NATURAL SOUNDSCAPE

Regulations and Policies

Acoustic regulations of the Federal Aviation Administration that relate to the use of all airports nationwide were summarized in Chapter 1, along with the additional requirements for the Jackson Hole Airport that are included in section 4 of the 1983 agreement. In addition, NPS policies indicate the following desired conditions in Grand Teton National Park with regard to natural soundscape relative to the presence and operation of the Jackson Hole Airport.

Desired Condition	Source
The Federal Aviation Administration, which has sole authority to control airspace over the United States, preserves, protects, and enhances the environment by minimizing, mitigating, or preventing the adverse effects of aircraft noise on Grand Teton National Park.	National Parks Air Tour Management Act of 2000
The natural ambient sound level – that is, the environment of sound that exists in the absence of human-caused noise – is the baseline condition, and the standard against which current conditions in a soundscape in Grand Teton National Park will be measured and evaluated.	*Management Policies 2006* (NPS 2006a)
The National Park Service preserves, to the greatest extent possible, the natural soundscapes of Grand Teton National Park and restores to the natural condition wherever possible those park soundscapes that have become degraded by unnatural sounds (noise).	*Management Policies 2006* (NPS 2006a)
The atmosphere of peace and tranquility, or the natural soundscape, is maintained in wilderness, natural, and historic locations within the park.	*Management Policies 2006* (NPS 2006a)
In other areas, the National Park Service preserves, to the greatest extent possible, the natural soundscapes and protects them from degradation caused by noise (undesirable, human-caused sound). However, the superintendent is mindful of the setting, and recognizes that the frequencies, magnitudes, and durations of acceptable levels of unnatural sound vary and are generally greater in developed areas. The practicability of achieving a natural soundscape at various park locations is considered as part of the management process.	*Management Policies 2006* (NPS 2006a)
The best available technology, within available resources, is used to restore degraded natural soundscapes in national parks.	*Management Policies 2006* (NPS 2006a)
The least sound-impacting equipment, vehicles, and transportation systems are used, consistent with public and employee safety.	*Management Policies 2006* (NPS 2006a)
The National Park Service monitors human activities that generate noise that adversely affects park soundscapes, including noise caused by mechanical or electronic devices.	*Management Policies 2006* (NPS 2006a)
The National Park Service takes action to prevent or minimize all noise that adversely affects the natural soundscape, or that exceeds levels that have been identified through monitoring as being acceptable to or appropriate for visitor uses at the sites being monitored.	*Management Policies 2006* (NPS 2006a)
For the general public and for aviation interests, the National Park Service develops educational materials describing the importance of the natural soundscape and tranquility to park visitors, and the need for cooperation from the aviation community.	*Management Policies 2006* (NPS 2006a)

Desired Condition	Source
The National Park Service works closely with the Federal Aviation Administration and with general aviation organizations to ensure that general aviation operations are conducted in accordance with applicable Federal Aviation Administration advisories and "fly-friendly" techniques and procedures designed to help pilots minimize impacts. The National Park Service seeks the assistance of these organizations in problem resolution if aviation concerns arise at the park.	*Management Policies 2006* (NPS 2006a)
The National Park Service works with the Jackson Hole Airport Board and fixed-base operator to prevent, reduce, or otherwise mitigate the effects of aircraft operations. The objective is to minimize noise and other impacts and confine them to the smallest and most appropriate portion of Grand Teton National Park, consistent with safe aircraft operations.	*Management Policies 2006* (NPS 2006a)

Methods

Modeling with the Integrated Noise Model

The Integrated Noise Model version 6.2a ("the model") was used to estimate the percent-time audible, maximum sound level, and energy-average sound level from aircraft arrivals and departures from the Jackson Hole Airport. The model estimates aircraft sound impacts using A-weighted and one-third octave band decibel levels. The Federal Aviation Administration and John A. Volpe National Transportation Systems Center (the developer of the model and part of the U.S. Department of Transportation's Research and Innovative Technology Administration) provided technical consultations throughout the modeling process. The airport's control tower staff, operating under a contract with the Federal Aviation Administration, furnished key inputs, including actual aircraft counts and flight tracks for the Jackson Hole Airport.

At the time of this analysis, the Integrated Noise Model version 6.2a was the best available model for estimating sound caused by aircraft. The model, which is distributed and sanctioned by the Federal Aviation Administration, is used worldwide for assessing impacts associated with airport operations. it is recognized that all computer models have limitations in accurately representing reality. Formal model validation was not conducted in this study. However, the model results were compared to field measurements at a number of sites in Grand Teton National Park. This comparison suggests that the model did a good job of estimating aircraft audibility. The results of the comparison are presented in more detail in Appendix G.

Models are best used to evaluate the *relative* effects of alternatives rather than to make absolute depictions of reality. Therefore, the current condition of the park's soundscape based on modeled results of recent airport operations (described in the "Affected Environment" section), rather than actual field measurements, provided the most meaningful basis for predicting changes in the soundscape that would occur with the airport operations that were predicted for each alternative.

Model Inputs

Integrated Noise Model 6.2a required specific information to forecast sound conditions with the different alternatives. Model inputs are described in Appendix G and included:

- Aircraft fleet mix and numbers of operations by aircraft type for each year modeled;
- Flight track information, including aircraft arrival and departure paths;

- All-year and peak-season natural ambient sound levels, in one-third octave frequency bands;
- Ground surface, temperature, and humidity;
- Topographic conditions of the areas being modeled; and
- Sound footprints for each aircraft used in the model.

As shown in Figure 14 from Shutt Moen Associates (2002), the takeoff and landing sound footprints among classes and models of aircraft vary widely. In addition, the general aviation aircraft business jet footprints illustrate how sound footprints have been reduced in more modern aircraft. Therefore, it was important for model inputs to include the best possible estimates of the numbers and models of aircraft that will be using the Jackson Hole Airport during the modeled period.

The aircraft fleet mix and use rates that were employed in modeling the alternatives in 2015 and 2025 were based on *Jackson Hole Airport Aircraft Operations Forecast: 2010-2025*, which was prepared by The Boyd Group, Inc. (2007a). Supplemental information on fleet mix was provided in an email (The Boyd Group, Inc. 2007b). However, some of the aircraft identified by The Boyd Group, Inc. were not among the selections available within the model. Therefore, the Federal Aviation Administration was contacted to identify appropriate surrogates. The resulting aircraft types and use rates that were used in modeling are presented in Table 33.

Subsequent to this analysis, a second Jackson Hole Airport operations forecast was prepared by Mead & Hunt, Inc. (2009). The forecast was developed to support the Jackson Hole Airport Board's airport operations enhancement study (safety audit) and showed a similar trend to that developed by The Boyd Group, Inc.

Model inputs based on actual conditions included the flight tracks, number of operations in the October 2004 through September 2005 baseline period, characteristics of each aircraft that result in sound generation, and topography of the area both in the park and within 10 miles of the Jackson Hole Airport.

Limitations of the Model

Model Inputs. Most of the model inputs are averages or median values rather than the actual, constantly varying values. These averages, such as aircraft operations, fleet mix, flight routes, temperature, humidity, and natural ambient sound level, will by definition result in model outputs that characterize average conditions. Other circumstances that affect sound propagation or attenuation, sometimes strongly, are not included in the model. Examples of these include temperature inversions and vegetation. During a temperature inversion, sounds from the ground or near-ground operations at the airport would propagate farther, sometimes substantially, than during non-inversion periods.

Overlapping Aircraft Events. In calculating percent-time audible, the model used an input that aircraft operations occur at evenly spaced intervals throughout the day and that the sound associated with each operation is a unique event. In practice, aircraft operations may be clustered. During busy periods, sounds from two or more aircraft may overlap and would reduce the percent of time during the day that aircraft sound would be audible. Therefore, the actual percent-time audible could be lower than indicated by the model.

FIGURE 14: SOUND FOOTPRINT OF SELECTED AIRCRAFT
(Source: Shutt Moen Associates 2002)

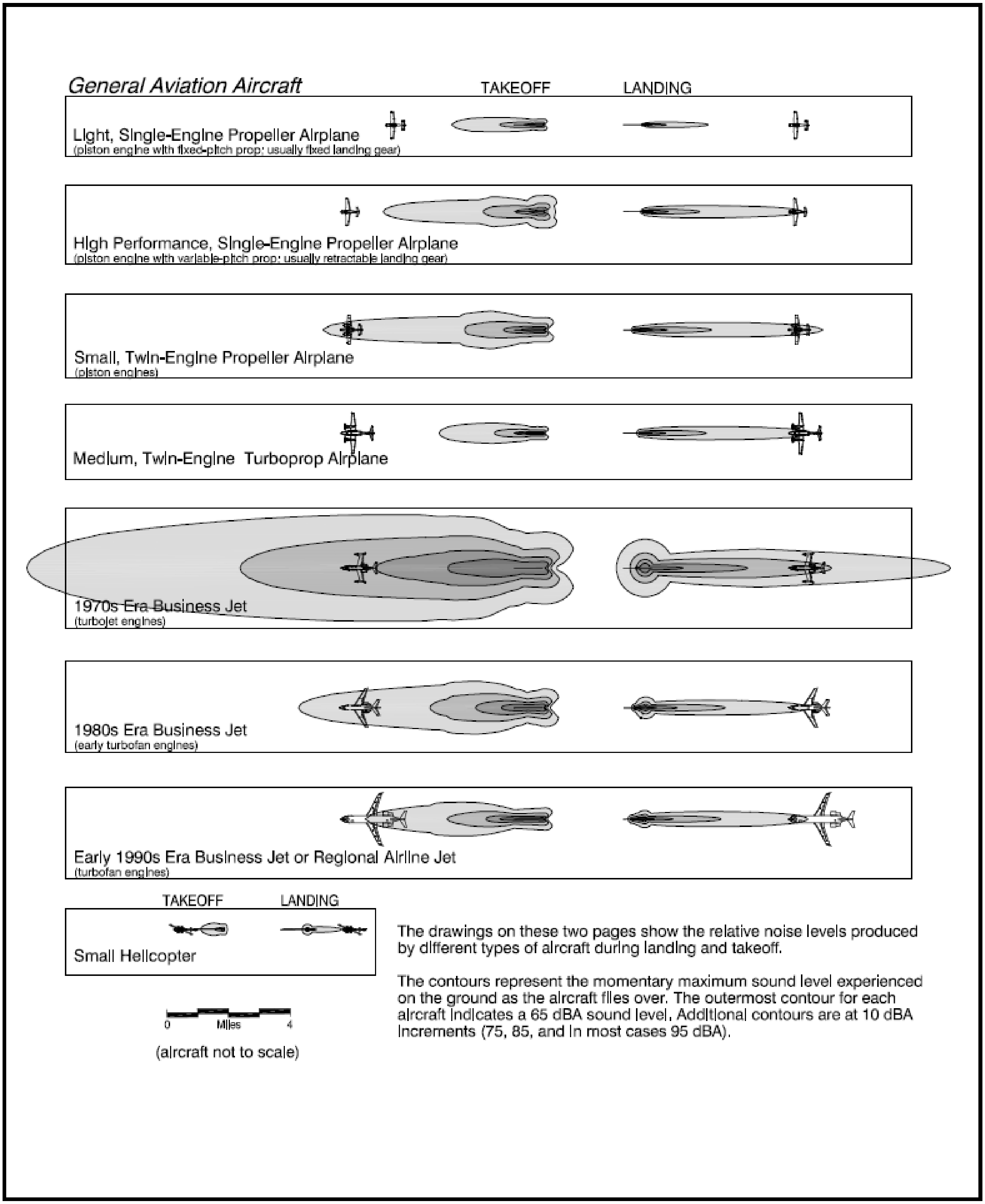


FIGURE 14: SOUND FOOTPRINTS OF SELECTED AIRCRAFT (CONTINUED)

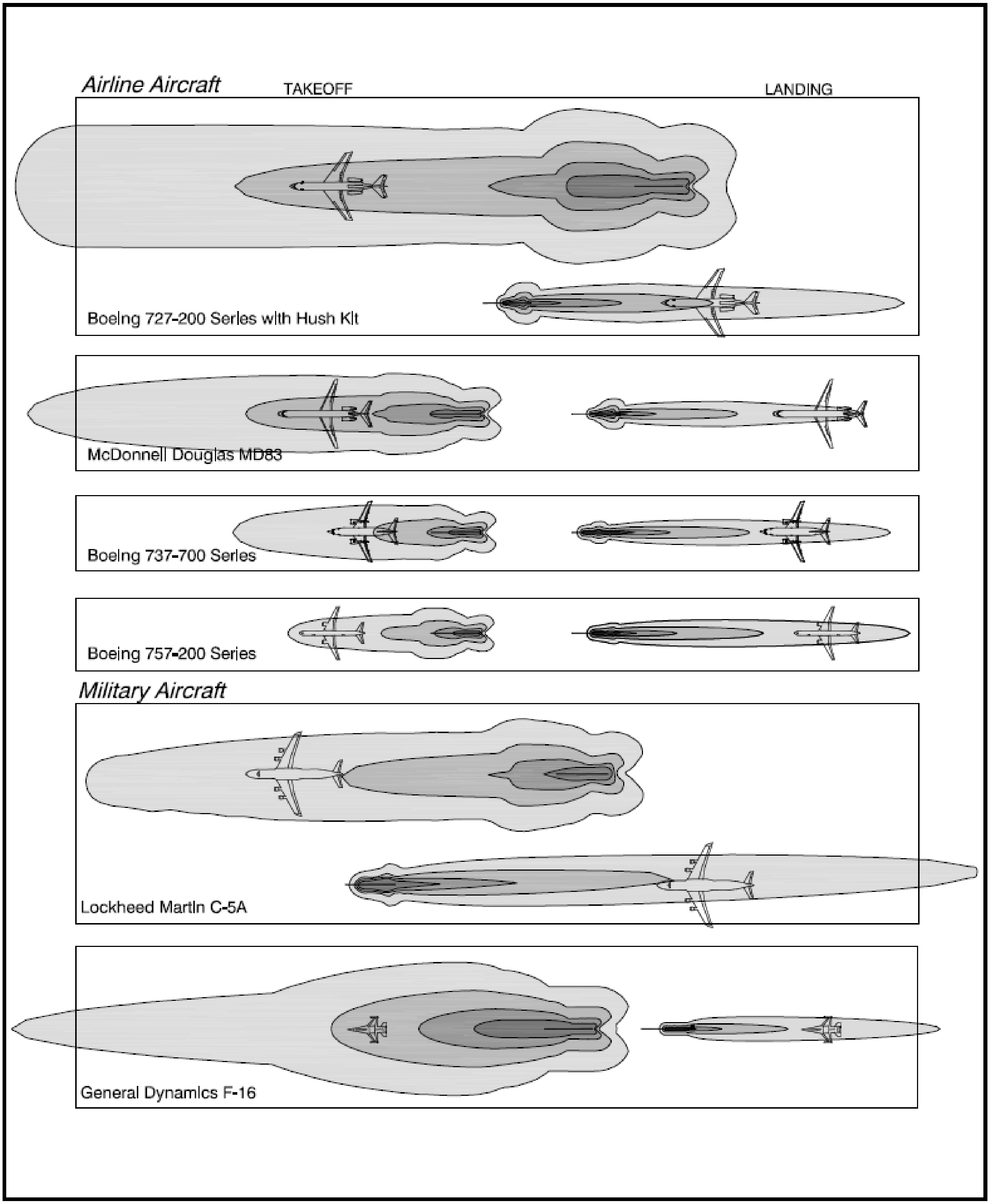


TABLE 33: FORECAST ANNUAL AND AVERAGE DAILY OPERATIONS AT THE JACKSON HOLE AIRPORT IN 2015 AND 2025 [a/]

Aircraft Type	2015		2025	
	Annual [b/]	Average Daily [b/]	Annual [b/]	Average Daily [b/]
Air carrier [c/]				
Boeing 737-300	525	1.4	174	0.5
Boeing 737-700/800	655	1.8	827	2.2
Boeing 757	610	1.7	610	1.7
Airbus 319	1,271	3.5	1,381	3.8
Airbus 320	660	1.8	671	1.8
Embraer 190/195	783	2.1	866	2.4
Subtotal	4,504	12.3	4,529	12.4
Regional carrier [c/]				
CRJ 900	1,613	4.4	1,834	5.0
CRJ 700	267	0.7	279	0.8
Dash 8-100	247	0.7	94	0.2
Dash 8 Q400	2,334	6.4	2,585	7.1
Embraer 120 ER	665	1.8	0	0.0
Subtotal	5,126	14.0	4,792	13.1
General aviation				
Large business jets				
Gulfstream IV	1,622	4.4	1,729	4.7
Citation X	811	2.2	864	2.4
Challenger	811	2.2	864	2.4
Dassualt Falcon 900	405	1.1	432	1.2
Global Express (CRJ700)	405	1.1	433	1.2
Mid-size business jets				
Hawker 800	1,304	3.6	1,397	3.8
Dassualt Falcon 50	931	2.6	998	2.7
Lear Jet 40/40	1,490	4.1	1,597	4.4
Small business jets				
Beechjet	2,244	6.2	2,255	6.2
Citation CJ	1,402	3.8	1,409	3.9
Citation Encore	1,122	3.1	1,127	3.1
Embraer Phenom	841	2.3	846	2.3
Very light jets				
Eclipse 500 [d/]	1,081	3.0	1,238	3.4
Cessna Mustang [d/]	1,081	3.0	1,237	3.4
Twin turboprops				
Conquest II	1,679	4.6	1,499	4.1
King Air	1,679	4.6	1,498	4.1
Single turboprops [e/]				
Cessna 172R	1,062	2.9	1,154	3.2
Cessna 206H	1,061	2.9	1,153	3.2
Piston twins				
Baron 58P	262	0.7	231	0.6
Piston single				
Single-engine, variable- pitch propeller	5093	14.0	5,325	14.5
Subtotal	26,386	72.4	27,286	74.8
Total	36,016	98.7	36,607	100.3

a/ Source: The Boyd Group, Inc. 2007a and 2007b.
b/ Some values were rounded.
c/ Air carrier and regional carrier operations were not included in the modeling of Alternative 1 because this alternative would not include scheduled passenger service.
d/ This aircraft type was suggested by the Federal Aviation Administration as a surrogate for an aircraft identified by The Boyd Group, Inc. that is not available within Integrated Noise Model version 6.2a.
e/ Integrated Noise Model 6.2a does not include any single turboprop aircraft in its database. Therefore, the numbers of aircraft in this class were accounted for in the modeling as these two single-piston aircraft types.

The overlap of sound from more than one aircraft could also produce a higher sound level than either plane alone. As a result, the maximum sound levels (Lmax) calculated by the model sometimes could be underestimated. However, as described under "Characteristics of Sound" in the acoustic primer in Chapter 3, the composite sound level would be no more than 3 dBA greater than the louder sound alone.

Masking. Most aircraft operations occur during the day when there are many other human-caused sounds that could potentially obscure or mask sounds from aircraft. Examples include sounds from road vehicles, building utilities, and human voices. These other human-caused sounds are not accounted for in the model and, whenever they were present, they would mask aircraft sounds and reduce the percent-time audible for aircraft using the airport. Impacts from other sources of human-caused sounds are addressed qualitatively in the cumulative impacts discussion for each alternative.

Some areas of the park, particularly sites in windy locations or along rivers or creeks, cause naturally occurring masking of aircraft sounds. Transient natural sounds, such as thunder, also occur. In these circumstances, the modeled percent-time audible values for aircraft would be overestimated. In undeveloped areas of the park that are much quieter than the average natural ambient sound level used in the model, the model would underestimate the aircraft percent-time audible.

Other Non-Airport Aircraft. The airspace over the park is regularly used by aircraft ranging from general aviation aircraft making local flights a few thousand feet above the ground to transcontinental aircraft flying at an elevation of several miles. The only controlled airspace is within 3,000 feet above the ground and within 5 miles of the tower. The model does not account for flights by transient aircraft not associated with operations at the airport. Instead, the effects of transient aircraft are included in the discussion of other human-caused sound in the cumulative impacts for each alternative.

Daily Averages Rather Than Hourly. Eight model runs were used to evaluate the alternatives. These include four runs to determine average all-year and July-through-September peak-season conditions in 2015 and 2025 for the no action alternative, and four similar runs for the action alternative. Modeling used a 15-hour day (7 A.M. to 10 P.M.). Each run took about six weeks to complete. Hourly estimates would have produced a more precise representation of conditions during each hour of the day, but would have required many additional model runs without changing the conclusions of average daily, seasonal, or annual impacts of the alternatives.

New Technology. Because there is no known method for accurately estimating their effects, the model does not account for new technologies, such as quieter engines or major advances in aircraft technology, that could reduce aircraft sound by 2015 or 2025. It also did not incorporate possible future navigational advances, such as those described in Chapter 2 under "Mitigation Measures." As stated by The Boyd Group, Inc. (2007a) in their forecast of airport operations, new technologies "may render historical data and assumptions . . . useless in forward-looking projections."

Conclusions. The limitations of the model identified here do not invalidate the results, particularly because the analysis involves comparing existing conditions and alternatives that all were modeled with the same limitations. However, these limitations should be understood when evaluating the model results.

Assumptions Used in Developing Airport Operations Forecasts

In its forecast of airport operations, The Boyd Group, Inc. (2007a) used the following assumptions and qualifications.

- Virtually no changes in seasonality are expected between now and 2025. Specifically, the peak tourism season will continue to be in the summer, a secondary peak will continue to occur during the winter ski season, and growing ownership of vacation or second homes will not substantially change the seasonality of the market.
- There would not be any important changes to Jackson Hole Airport operations. For example:
  - The voluntary curfew would remain in effect, and operations would not occur between 11:30 P.M. and 6:00 A.M.
  - The ban on Stage 2 aircraft would continue, but no additional bans would occur during the forecast period.
  - There would not be any substantial increase in the capacity of the fixed-base operator or changes in ramp parking space for aircraft.
- There would not be any major changes to the Jackson Hole economic base or visitor demographics.
- With regard to fleets and strategies of scheduled passenger service operations at the Jackson Hole Airport, changes in fleet mix will slow future growth in number of operations by scheduled passenger carriers. In particular, an increase in the average size of regional carrier aircraft will increase capacity with little change in the number of operations.
- The new breed of very light jets may render historical data and assumptions regarding business and general aviation inappropriate for projections.

The Boyd Group, Inc. (2007a) also considered such factors as fleets and operations for air carriers and regional carriers; business jet sales, demand, and activities, including fractional ownership; changes in the general aviation turboprop and piston fleets; and macro factors affecting aviation, including Federal Aviation Administration funding formulas, security requirements for general aviation, and fuel costs.

No attempts were made to forecast or model the period beyond 2025 because of the uncertainty inherent in long-term projections for the aviation industry (Federal Aviation Administration 2010). The values provided by The Boyd Group, Inc. (2007a) for 2025 represent best professional judgments, but estimates beyond 2025 would have such a high degree of uncertainty as to be speculative.

Jackson Hole Airport staff believe that general aviation use of the airport could increase by an amount greater than that predicted by The Boyd Group, Inc. (2007a) if scheduled passenger service ended. Factors supporting this premise include the following.

- During busy seasons, the airport's parking area for general aviation aircraft is full and is subject to a reservation system. This indicates that during these periods, there is unmet demand for general aviation use. If scheduled passenger service and its associated overnight parking ended, about twice as much ramp space would be available to park general aviation aircraft, and increased busy-season use associated with the currently unmet demand would occur.
- Some of the general aviation aircraft that currently are based at other public and private airstrips in the region might relocate to the Jackson Hole Airport if additional ramp space was available.
- The Jackson Hole Airport is used by an unusually high proportion of very wealthy people. If scheduled passenger service ended, some of these people probably would charter general aviation flights to the area. Particularly during busy seasons, this would increase general aviation traffic.

The National Park Service recognizes that the forecast of general aviation that was used as a model input affects the modeled results. Therefore, although values from The Boyd Group, Inc. (2007a) were used in modeling, the National Park Service acknowledges that different results would occur with different forecasts, and that the higher general aviation use between 2013 and 2033 that is anticipated by the Jackson Hole Airport staff would result in a smaller difference between the no action alternative and action alternative with regard to percent of the time aircraft were audible. However, the amount of available ramp space limits general aviation only a few days each year, mostly around holidays. Therefore, loss of scheduled passenger traffic would have a minimal affect on general aviation traffic most of the year and was not considered in the model.

Modeling Procedures and Outputs

Alternatives were modeled for all-year and peak-season (July through September) periods in the years 2015 and 2025 based on flight operations obtained from the airport tower for the period October 2004 to September 2005. These data provided a representation of existing conditions and were the baseline against which the results for Alternative 1, no action, were compared. The modeling output allows a comparison between alternatives and existing conditions.

Modeling was based on a 15-hour day (7 A.M. to 10 P.M.) to correspond with the period during which most aircraft arrivals and departures occur (see Figure 6). A total of 13 arrival and eight departure flight tracks were modeled, based on actual flight tracks that were provided by the staff of the airport's control tower. While individual aircraft may vary from these tracks because of weather conditions, pilot preference, or other air traffic, the flight tracks provide a representation of air traffic in the vicinity of the Jackson Hole Airport.

The complete fleet mix of aircraft presented in Table 33 was used to model sound under Alternative 2. Sound modeling for Alternative 1 in the years 2015 and 2025, which would not include scheduled passenger service, used only the data for general aviation aircraft that are presented in the table. Because Integrated Noise Model 6.2a does not include single-turboprop aircraft in its database, the numbers of aircraft in this class from The Boyd Group, Inc. (2007a) forecast were substituted by single-piston aircraft.

For all-year and peak-season conditions, modeling produced the following information for 659 grid point locations, shown in Figure 8, within and around Grand Teton National Park:

- Maximum sound level (Lmax), expressed as A-weighted decibels (dBA);
- Percent-time audible (only for locations within the national park);
- Total time in minutes within a 15-hour operations day that aircraft sound above 60 dBA occurs; and
- 15-hour energy-average sound level, or Leq. (See the discussion of the difference between day-night average sound level (DNL) and Leq in the "Acoustic Primer" in Chapter 3 and the glossary).

Appendix G, Method for Sound Modeling and Analysis of Aircraft Sound Impacts, provides details of the sound modeling process and procedures. It also presents the model results for energy-average sound levels and provides the percent-time audible and time above 60 dBA results in map form. Modeled values for each of these features at each point shown in Figure 8 are available in tabular form on the NPS' Internet site at <www.nps.gov/grte/parkmgmt/planning.htm>.

Impact Thresholds and Issues

As described above, modeling provided information on acoustic metrics that can illustrate the potential effects of aircraft using the Jackson Hole Airport on the natural soundscape of Grand Teton National Park. The data from each modeled point can be used to determine the amount of the park that is affected by aircraft using the Jackson Hole Airport.

Although each metric is useful in understanding the effects of aircraft sound, they each have limitations. For example, the Lmax metric is useful in describing the maximum sound level that might be experienced at a location, but provides no information regarding the duration or frequency of the sound, or information about aircraft sounds that are less than the maximum. Similarly, the modeled data can be used to understand the percent of the park in which aircraft using the Jackson Hole Airport are audible. However, that information provides little insight into the magnitude of those effects at any point. It merely provides information about how much of the park has modeled audibility at some non-zero level. Some areas of the park, such as those nearest the airport, would experience relatively loud sounds and relatively high percent-time audible, while other areas more distant from the airport would experience aircraft sound infrequently and at very low sound levels.

The manner in which aircraft travel through the airspace above the park also is important. Aircraft are moving sound sources and are not constrained by the location of roads, developed areas, or other features on the ground (except terrain). They generally travel along flight paths that are predictable and well-established (see Figures G-32 and G-33 in Appendix G). Because of this, a relatively small number of aircraft determine the area of the park that is affected. Increasing the number of aircraft would have a limited effect in increasing the amount of the park affected, but would tend to increase the amount of time that aircraft are audible. Therefore, the area of the park affected is best combined with other metrics to distinguish between the effects of alternatives.

The impact thresholds used in this analysis are based on how much of the park is affected to a certain degree. Specifically, the thresholds for impacts that are deemed negligible, minor, moderate, or major are based on how much of the park is affected by aircraft sound related to operations at the Jackson Hole Airport 10% or more of the time. The park-wide metric is used for the impact determination because the National Park Service is responsible for protecting the natural soundscape of the entire park, rather than just certain portions of it, such as where visitors would be most likely to be present. The park-wide metric also recognizes that aircraft travel over the park unconstrained by the location of roads or developed areas, and that aircraft sounds are distributed over a wide area of the park. The impact analysis considered only the peak-season modeling results for each alternative, because this represents the period when the impacts would be greatest.

The percent of time that aircraft sounds are audible at any point is, to some extent, a proxy for the relative sound levels that would be experienced. Aircraft are moving sound sources generally traveling to and from a single location in the park (that is, the airport), all the while changing altitude and power settings. All other things being equal, the louder a moving sound source is, the longer it will be audible from a particular location. Thus, areas with higher percent-time audible values will generally also experience higher sound levels. This relationship is evident in the modeling data.

The 10% audibility threshold approximates the percent of time that transient aircraft (that is, those that are not using the airport and are simply transiting the airspace, often at high altitude) are audible over Grand Teton and Yellowstone national parks(NPS unpublished data). Most of these aircraft result in relatively low sound levels, but on any day, the sounds of transient aircraft may be audible at some time over virtually the entire park. Because of the relationship between percent-time audible and sound levels, areas of the park that experience modeled audibility greater than 10% would also experience generally higher sound levels than those resulting from transient aircraft. Thus, areas of the park with modeled audibility greater than 10% would be distinguishable from the “background” in terms of both audibility and sound level.

Results Presentation. The analysis presents data in a variety of ways that are intended to help the reader understand the impacts on the natural soundscapes of the park. For example, pie charts are used to illustrate the distribution of modeled points, corresponding to the amount of the park, where certain levels of audibility occur. For the purpose of determining the overall impact of each alternative on the natural soundscapes, only the park-wide metric is considered.

Natural Soundscape Impact Thresholds. The impact thresholds for natural soundscapes presented below were developed using best professional judgment of the NPS staff involved in the preparation of this environmental impact statement.

Negligible: An action that may affect the natural soundscape or potential for its enjoyment by resulting in aircraft sound that is audible 10% or more of the time over less than 5% of the park. Conversely, aircraft noise would be audible less than 10% of the time over at least 95% of the park.

Minor: An action that may affect the natural soundscape or potential for its enjoyment by resulting in aircraft sound that is audible 10% or more of the time over less than 10% of the park. Conversely, aircraft sound would be audible less than 10% of the time over at least 90% of the park.

Moderate: An action that may affect the natural soundscape or potential for its enjoyment by resulting in aircraft sound that is audible 10% or more of the time over less than 20% of the park. Conversely, aircraft sound would be audible less than 10% of the time over at least 80% of the park.

Major: An action that may affect the natural soundscape or potential for its enjoyment by resulting in aircraft sound that is audible 10% or more of the time over 20% or more of the park. Conversely, aircraft noise would be audible less than 10% of the time over less than 80% of the park.

Short-term: Effects would occur only during and shortly after a specified action or treatment.

Long-term: Effects would persist well beyond the duration of a specified action or treatment, or would not be associated with an particular activity such as construction. Long-term effects also include events of short duration, such as the sound from an aircraft taking off or landing, that occur regularly, such as daily, over an extended period of time.

The analysis includes 489 modeled points in Grand Teton National Park, plus 170 points outside the park within a 10-mile radius of the runway center-point. Only the points in the park were used in determining the impacts on the natural soundscape of the park.

Assessing Impacts Outside the Park. For areas outside the park that could be affected by changes in aircraft sound from the alternatives, the Federal Aviation Administration criteria in Table 1 were generally applied. However, these criteria were only used as indicators because:

- They apply to *increases* in sound levels, and the alternatives include *decreases* in aircraft sound.
- The policy of the National Park Service, which is the agency responsible for this environmental impact statement, is to make findings of significance only in the record of decision. In contrast, the Federal Aviation Administration criteria in Table 1 inherently assign significance.

Because the National Park Service does not use the Federal Aviation Administration approach for evaluating aircraft sound, it will not make findings of marginal or significant impacts that are included in Table 1. As a result, even an alternative that the National Park Service determines would have a major, adverse impact on the natural soundscape would not necessarily meet the Federal Aviation Administration's standard for "significant." However, this analysis will consider areas that are predicted by modeling to have a 15-hour Leq of at least 45 dBA against the criteria shown in Table 1.

Scoping Comments. Six issues relating to aircraft sound were identified during scoping. Three focused primarily on changes in airport operations that could result from extending the 1983 agreement and included:

- Effects on sound levels in the park. This includes effects from changes in air traffic levels, the sizes of aircraft, airport ground operations, and any mitigation measures; and changes in the ability to meet the noise requirements of the 1983 agreement.
- Effects on sound audibility in the park.
- Effects on sound levels on private land in Teton County.

The other issues considered sound from the airport in association with sound from other sources, plus changes in sound that could occur from improvements in technology. These issues are evaluated as cumulative impacts and include:

- Effects on sound from aircraft overflights not associated with the Jackson Hole Airport, plus interagency helibase flights.
- Effects of airport sound in conjunction with sound from all other sources, including highway sound and sound from projects on public and private lands in the vicinity.
- Effects of anticipated technological advances on sound levels from the alternatives.

Unique Situation in Grand Teton National Park. The NPS mission under the Organic Act of 1916 is to preserve park resources and values unimpaired, a much higher level of protection than the charge given to most other agencies. For example, the National Park Service cannot manage merely to prevent community annoyance, a commonly used standard for airport impact analyses, but rather to protect the soundscape resource itself. In accordance with *Management Policies 2006* (NPS 2006a), the National Park Service must seek ways to avoid or to minimize to the greatest extent practicable, adverse impacts on park resources and values, and to work with entities having jurisdiction over airports adjacent to parks for the purpose of preventing, reducing, or otherwise mitigating the effects of aircraft operations. The NPS' interpretation of the impacts to park resources and values will likely be different from and more protective than standards established by other agencies, but such determinations are solely within the NPS' jurisdiction.

In environmental and planning documents where the National Park Service analyzes noise to assess impacts on park resources and values, the National Park Service currently chooses from among a suite of metrics that includes audibility, maximum sound level, listening area reduction, alerting distance, noise-free intervals, and number of events. The National Park Service also uses a variety of time-above metrics (for example, time above 60 dBA, 45 dBA, and 52 dBA) to address, among other thing, sleep interruption and speech interference. Changes in sound energy exposure can be evaluated using the difference between Leq (non-natural) and Leq (natural).

This environmental impact statement analyzed the effects of aircraft sounds on park resources using a variety of metrics that were available and in use at the time that the modeling was initiated. Since that time, metrics such as those listed above are being used in NPS environmental and planning documents.

The methods and impact thresholds used for the soundscapes analysis in this environmental impact statement are appropriate for the particular circumstances at Grand Teton National Park, but would not necessarily be appropriate in other circumstances for the following reasons:

- The geographic location of the airport in the park, and its relationship to key park resources and patterns of visitor use, are distinct to Grand Teton National Park.
- The fleet mix, number and types of operations, and characteristics of the flight routes (that is, arrivals and departures from the fixed location of an airport) produce a set of conditions that would be substantially different from those in other national parks or areas where aircraft are present. For example, air tours in and around other national parks would involve very different types of aircraft and very different types of flight routes and patterns than those associated with use of the Jackson Hole Airport.
- The patterns, distribution, and magnitude of aircraft noise effects relative to key park resources, visitor use activities, and other factors that are distinct to the park, such as geography, topography, and the location of roads and development nodes, provide a context that is singular to Grand Teton National Park. Differences in these factors in other NPS units might define the need for a different approach or set of impact thresholds.

Air tours or other types of aircraft use occur in other national park system units but are not authorized in Grand Teton National Park. These likely would involve a very different fleet mix and use of the airspace and would, therefore, potentially warrant different analysis methods or impact topics.

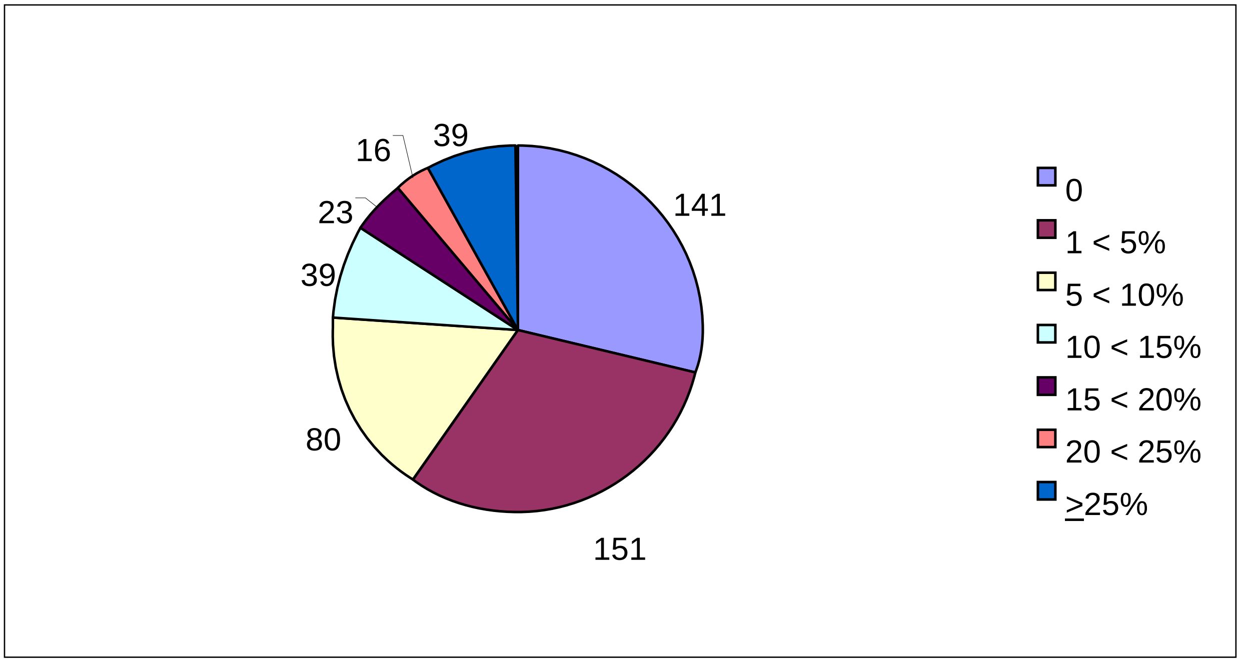
Analysis

Acoustic Metric That Determines Impact Designation

Figure 15 presents the distribution and number of the 489 modeled analysis points in the park in each percent-time audible category under existing (2005) peak-season conditions. For example, during the 2005 peak season, aircraft using the Jackson Hole Airport were audible between 1% and 5% of the time at 151 of the modeled 489 points (31%) in the park. Based on these values, aircraft were audible less than 10% of the time at 372 points (76% of the park). In about 8% of the park (39 points), aircraft using the airport were audible more than 25% of the time. Most of these points are within 3 miles of the airport, and all but four are within 5 miles. Figure 15 represents the current conditions to which Alternative 1 was compared.

Under Alternative 1, the Jackson Hole Airport is presumed to have lost its Federal Aviation Administration Part 139 certification by 2015. Therefore, scheduled passenger air carriers and regional carriers would no longer provide service to the airport, although general aviation would continue through the period of analysis (2025).

FIGURE 15: NUMBER OF POINTS IN GRAND TETON NATIONAL PARK BY MODELED PERCENT OF TIME AUDIBLE FOR THE 2005 PEAK SEASON



Figures 16 and 17 illustrate the modeled results for park-wide percent of time audible under Alternative 1 for the 2015 and 2025 peak seasons, respectively. Compared to Figure 15, the modeling results indicate that the percent-time audible would decrease from current conditions. The area of the park where aircraft would be audible more than 10% of the time would be 19% and 20% in 2015 and 2025 respectively, compared to 24% of the park in 2005. The amount of the park where aircraft would be audible 25% or more of the time would be 7% in both 2015 and 2025, compared to 8% in 2005.

As noted previously, areas of the park for which percent of time audible is relatively low also experience sound levels that are relatively low. For the 2015 peak season:

- In areas of the park where aircraft would be audible less than 10% of the time, 77% of the modeled points would have a maximum sound level of less than 60 dBA, and 65% of the points would have a maximum sound level of less than 50 dBA. For points where the percent of time audible would be less than 10% but maximum sound level would be greater than 60 dBA, the average time above 60 dBA would be 0.05 minutes (3 seconds) per day.
- Conversely, areas of the park where aircraft percent of time audible would be relatively high also would experience higher sound levels. For the 2015 peak season, areas of the park where aircraft would be audible 20% or more of the time (41 points, or 9% of the park), maximum sound levels would range from 40 to 106 dBA, with an average value of 66 dBA. Time above 60 dBA for these points would range from zero to 34 minutes per day, with an average of 3.3 minutes. Eighteen of the 41 points would have no time above 60 dBA.

Figure 18 presents the modeled results for aircraft percent of time audible for current (2005) conditions, and in 2015 for Alternatives 1 and 2. These are the same data shown in Figures 15 and 16, but they are provided in bar chart format, and include data from Alternative 2. This format facilitates comparison of the data from the two alternatives and current conditions. Figure 19 provides the corresponding information for 2025.

FIGURE 16: NUMBER OF POINTS IN GRAND TETON NATIONAL PARK BY PERCENT OF TIME AUDIBLE FOR 2015 PEAK SEASON UNDER ALTERNATIVE 1

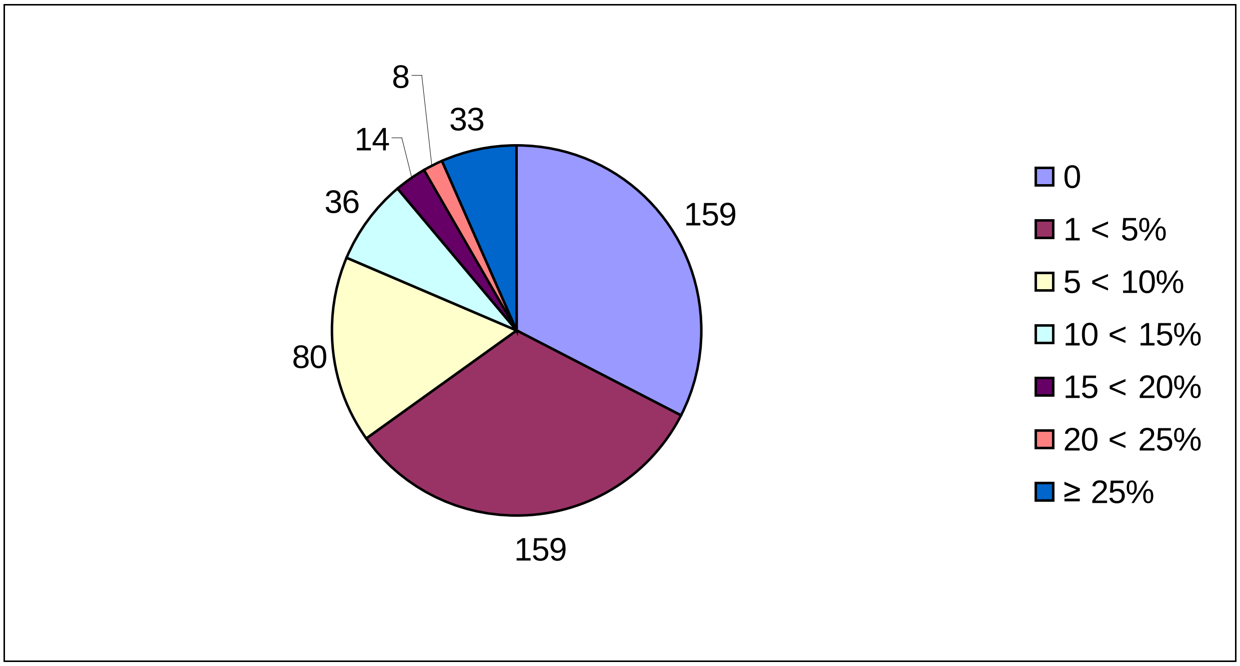


FIGURE 17: NUMBER OF POINTS IN GRAND TETON NATIONAL PARK BY PERCENT OF TIME AUDIBLE FOR 2025 PEAK SEASON UNDER ALTERNATIVE 1

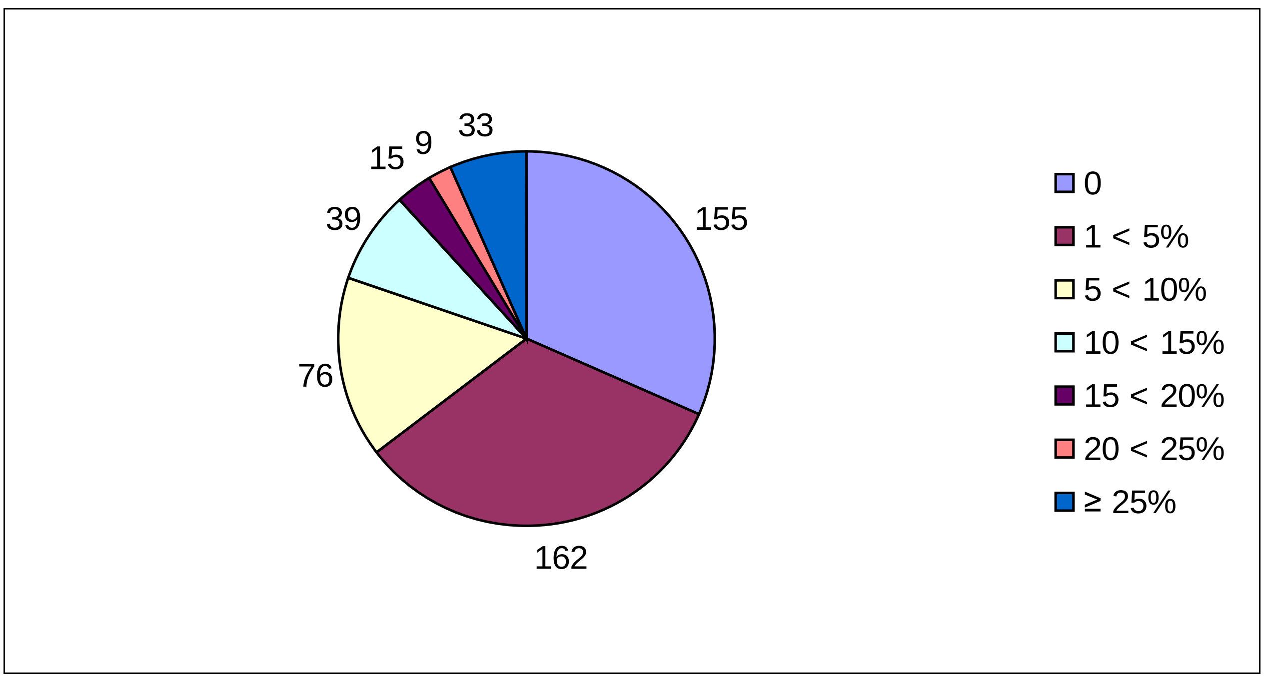


FIGURE 18: PERCENT OF TIME AUDIBLE IN GRAND TETON NATIONAL PARK FROM AIRCRAFT USING JACKSON HOLE AIRPORT IN 2005 AND 2015 FOR PEAK SEASON

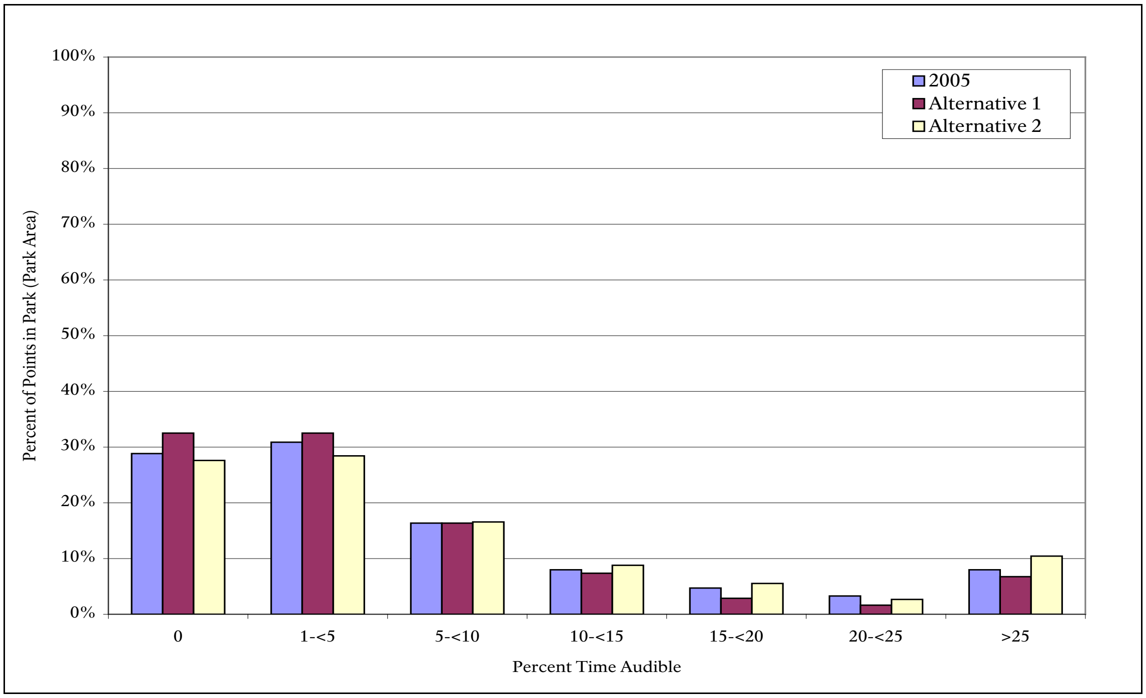
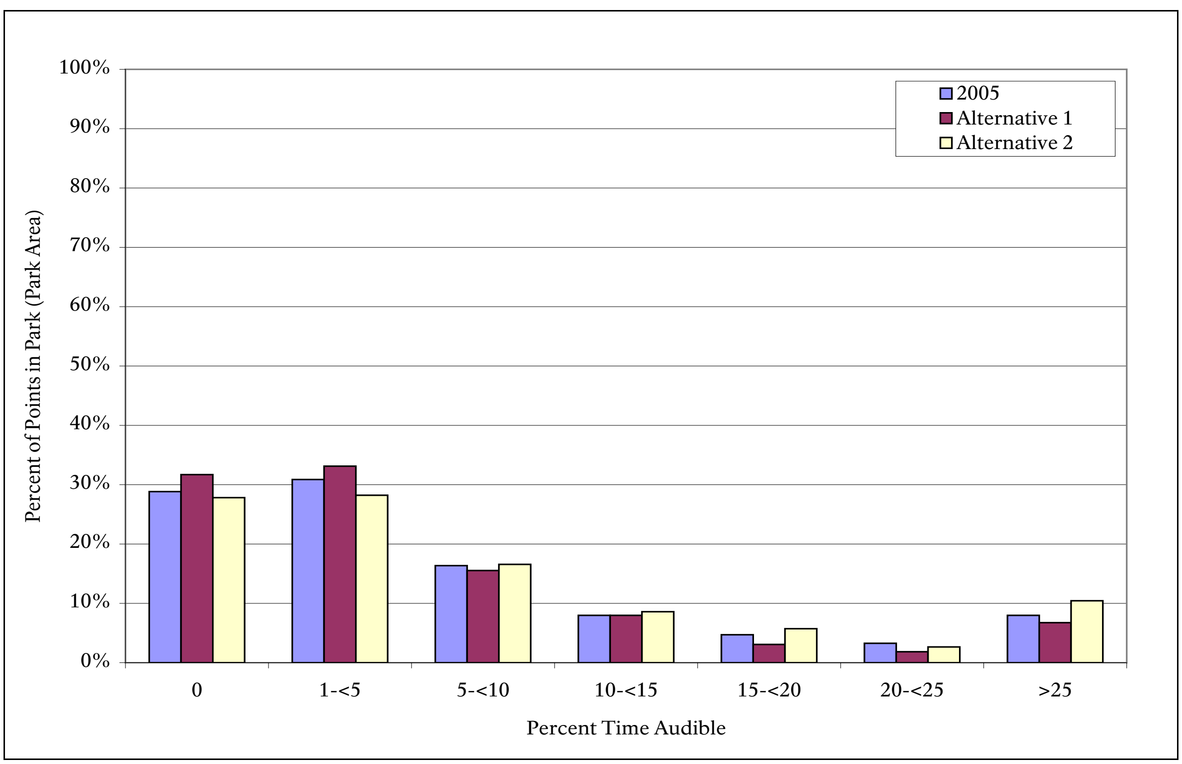


FIGURE 19: PERCENT OF TIME AUDIBLE IN GRAND TETON NATIONAL PARK FROM AIRCRAFT USING JACKSON HOLE AIRPORT IN 2005 AND 2025 FOR PEAK SEASON



The modeled results for Alternative 1 show that conditions in 2015 and 2025 would be similar to current conditions.

- There would be a change of less than 1% in the area of the park in which airport-related aircraft sound would be audible. For example, under all-year conditions in 2015, airplane sound would be audible in about 83% of the park and in 2025 it would be audible in about 87% of the park.
- Compared to current conditions, the area of the park in which aircraft using the airport would be audible 5% or less of the time (or three minutes each hour) would increase (park would become quieter). In both 2015 and 2025, the increase on an all-year basis would be by about 10 percentage points, to almost 60% of the points in the park. Increases of about 5 percentage points would occur during the peak seasons, to more than 50% of the points.
- The distribution of all other percent of time audible values would be within one or two percentage points of those currently occurring.
- For locations nearest the airport, the highest percent-time audible values would continue to be 30% of the time (or 18 minutes each hour) on an all-year basis and 45% of the time (or 27 minutes each hour) during the peak season.

Based on the impact threshold definitions, the effects of Alternative 1 on the natural soundscape of Grand Teton National Park would be major, direct, long-term, and adverse. In both 2015 and 2025, aircraft using the Jackson Hole Airport would be audible less than 10% of the time over approximately 80% of the park, just at the threshold for the major impact category. The effects would be most evident within a few miles of the airport, and would affect predominantly areas in the southern portions of the park. With increasing distance from the airport and aircraft flight paths, aircraft sounds would diminish to the point of being negligible impacts.

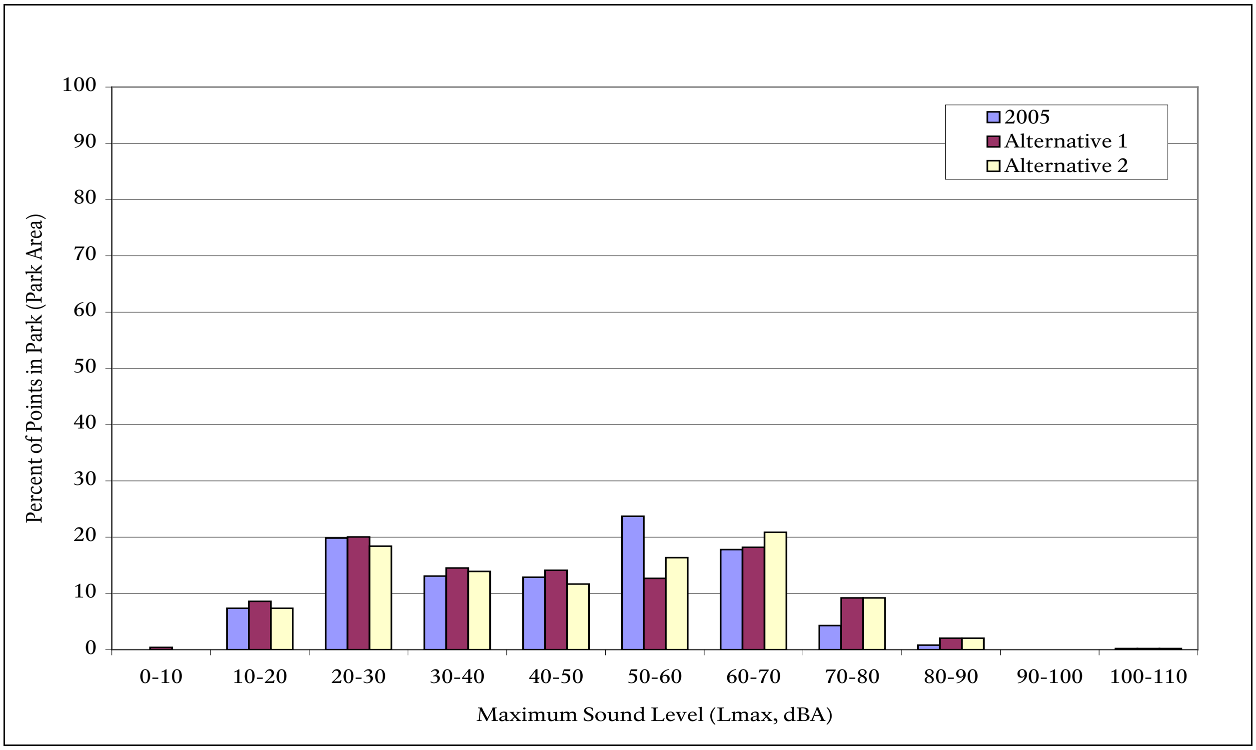
Additional Acoustic Metrics

For Alternative 1 in 2015 and 2025, the greatest impacts on the natural soundscape would occur closest to the airport. With increasing distance from the airport and aircraft flight paths, the magnitude of aircraft sounds would diminish, becoming negligible in the north part of the park. This situation would not represent a change from the existing condition.

Maximum Sound Levels in Grand Teton National Park. The modeled maximum sound levels (Lmax) for airport-related aircraft at locations in the park in 2005 and for Alternative 1 in 2015 and 2025 are shown in Figure 20. The Lmax at any location depends on the proximity and type of aircraft in the fleet, and not on the number of operations carried out by those aircraft. Because the fleet mix and modeled flight routes do not change between 2015 and 2025, the predicted Lmax associated with Alternative 1 in these years would be identical.

As shown in Figure 20, there would be a slight pattern regarding Lmax compared to current conditions. The shift in the fleet mix that would occur with Alternative 1 would cause a decrease in Lmax at the lower sound levels and would increase the Lmax at the upper end of the range. Areas experiencing Lmax values greater than 60 dBA would increase from about 23% of modeled park points in 2005 to about 30% of modeled park points in 2015 and 2025.

FIGURE 20: MODELED MAXIMUM SOUND LEVELS (LMAX) FROM JACKSON HOLE AIRPORT OPERATIONS WITHIN GRAND TETON NATIONAL PARK IN 2005 AND 2015
(2025 would be identical to 2015, see text)



15-Hour Energy-Average Sound Level (Leq). Maps showing the Leq, based on a 15-hour day (7 A.M. to 10 P.M.), that would be associated with Alternative 1 are provided in Appendix G. Figures G-22 and G-27 show 2015 patterns for all-year and peak-season conditions, respectively, and the corresponding patterns for 2025 are shown in Figures G-24 and G-29. All of these figures show the areas of the park (indicated with blue hatching) where the day-night average sound level associated with airport operations cannot exceed 55 dBA, and the 45-dBA line (shown in purple) specified in the 1983 agreement.

The patterns of Leq were similar between all-year conditions and the July-through-September peak season, and between current conditions, 2015, and 2025. For example, in all situations, the 65 dBA Leq contour north of the runway would remain within the airport boundary.

For all-year conditions in 2015 and 2025, the 65 dBA Leq contour south of the runway would end close to the airport's south boundary. Under peak-season conditions in 2015 and 2025, this contour would extend less than a quarter-mile into private land beyond the south airport boundary. The 45 dBA to 60 dBA Leq contours outside the park would be similar to those currently occurring (see Figures G-21 and G-26). Based on these relatively small changes, none of the Federal Aviation Administration criteria in Table 1 would be expected to apply.

Time above 60 dBA. The predicted values for percent of the time above 60 dBA at locations in the park for Alternative 1 in 2015, based on a 15-hour day (7 A.M. to 10 P.M.) during the July-through-September peak season are presented in Figure 21. Corresponding data for 2025 are presented in Figure 22. The modeled results for Alternative 1 show that conditions in 2015 and 2025 would be very similar to current conditions, and that none of the distribution values would change by more than 2 percentage points from year 2005 data.

FIGURE 21: TIME ABOVE 60 DBA IN GRAND TETON NATIONAL PARK FROM AIRCRAFT USING JACKSON HOLE AIRPORT IN 2005 AND 2015 FOR PEAK SEASON

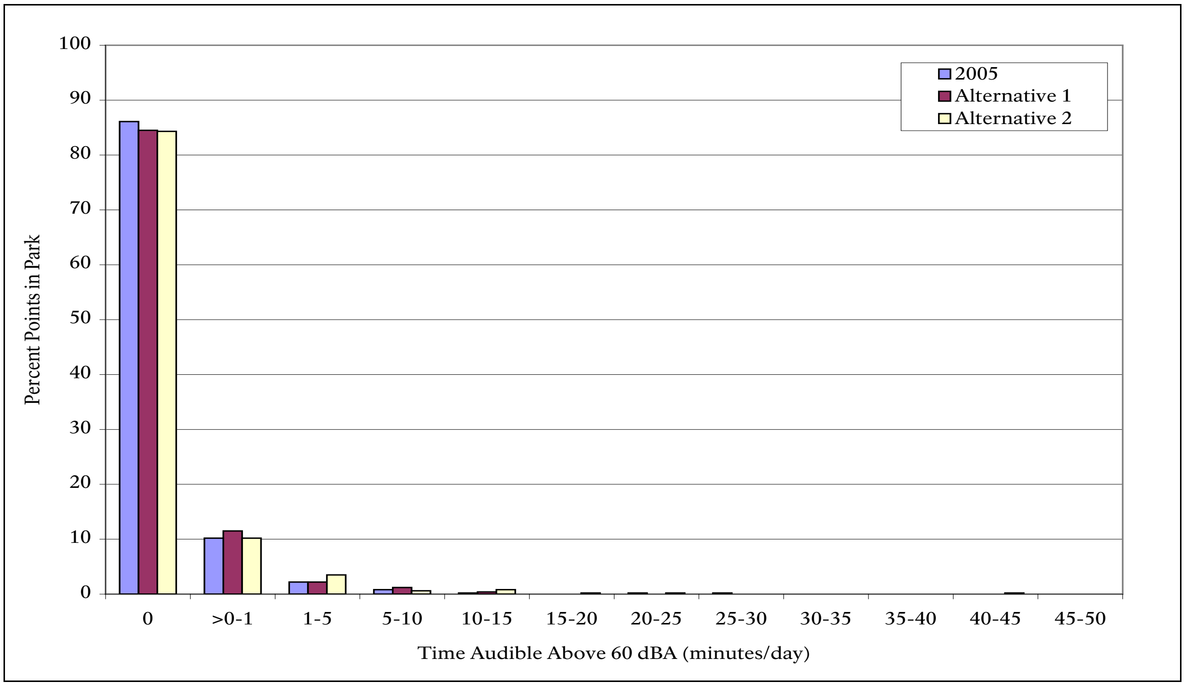
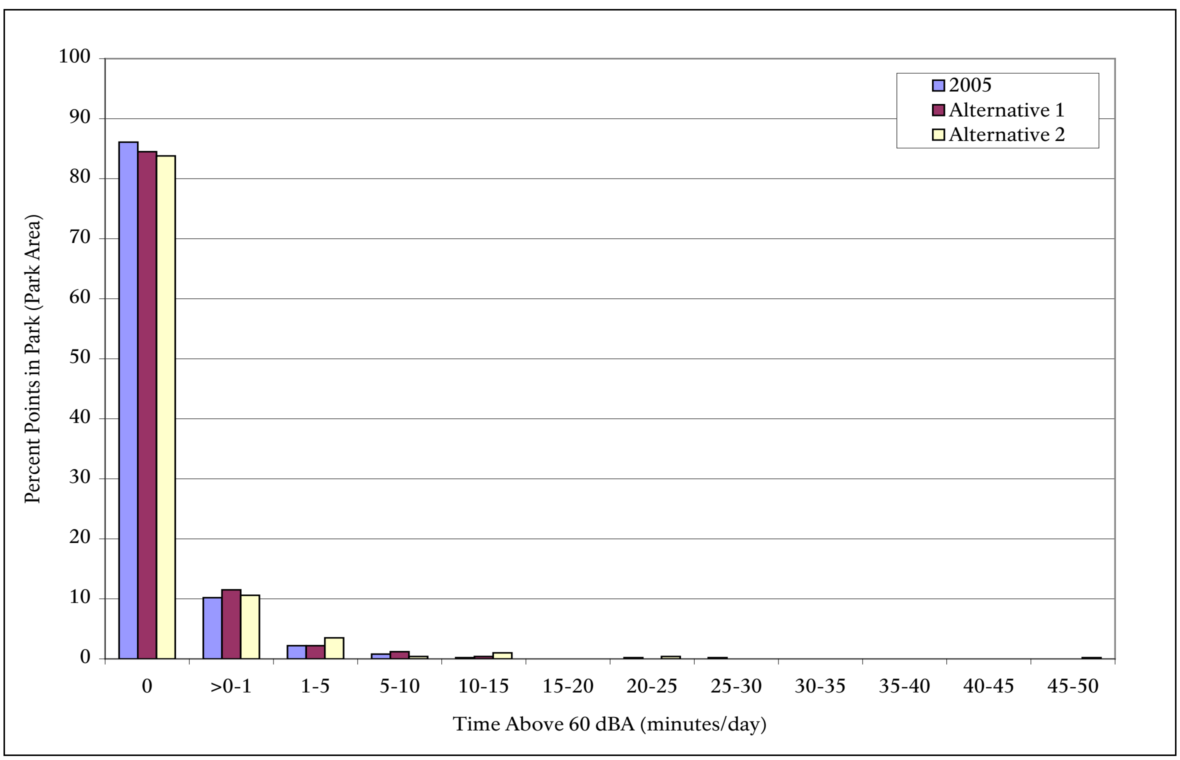


FIGURE 22: TIME ABOVE 60 DBA IN GRAND TETON NATIONAL PARK FROM AIRCRAFT USING JACKSON HOLE AIRPORT IN 2005 AND 2025 FOR PEAK SEASON



Effects of the Jackson Hole Airport on Natural Soundscapes in Recommended Wilderness

In the Mountain Zone, 222 grid points are in the recommended wilderness boundary. The modeled, peak-season acoustical impacts from airport-related aircraft operations at these points under Alternative 1 showed little difference from 2005 conditions and included the following:

- The maximum modeled sound levels within the recommended wilderness area were virtually unchanged, from the current range of 11 to 57.7 dBA to a range extending from 8.2 to 59.6 dBA in both 2015 and 2025.
- No points had any time above 60 dBA, which represents no change from the 2005 baseline.
- Four points (compared to three points in the baseline) were above 20% time audible, with a maximum in 2015 of 28% and a maximum in 2025 of 29% (compared to a maximum of 24% in the baseline).
- Six points (compared to nine points in the baseline) were above 15% time audible, and 11 points in 2015 and 12 points in 2025 (compared to 15 points in the baseline) were above 10% time audible.
- In 2015, 123 points (55% of the Mountain Zone) and in 2025, 136 points (61% of the Mountain Zone) had airport-related aircraft audibility of zero. These represent improvements compared to the 2005 baseline value of 116 points (52%).
- As under baseline conditions, the acoustical effects from the airport-related aircraft decreased as the distance from the airport and the flight routes increased.

Aircraft Sound on Lands Outside the Park

Based on the analysis of 170 points outside the park, sound effects of Alternative 1, based on a 15-hour day (7 A.M. to 10 P.M.), were compared to current conditions. Results would be as follows:

- Leq for areas outside the park were discussed above.
- The maximum sound levels outside the park in both 2015 and 2025 would be 95 dBA, about 3 dBA louder than 2005 maximums.
- For the all-year period in 2015, the area in which aircraft sound was below 60 dBA would decrease by about 4%, from 57% to 53%. The area in which aircraft typically would be at 60 dBA or more for less than a minute during the daily period of airport operations would increase slightly, from 30% to 32%. The highest values for time above 60 dBA would increase from the current 17 minutes to 21 minutes per day.
- All-year and July-through-September peak-season conditions in 2015 would have a similar percentage distribution of the modeled areas for time above 60 dBA. However, the highest value for time above 60 dBA for peak-season conditions would be 26 minutes per day.
- In 2025, all-year conditions would be nearly identical to those in 2015. However, during the 2025 peak season, the area in which aircraft sound was below 60 dBA would decrease to 50% of the points in the modeled area, and the highest value for time above 60 dBA would be 34 minutes per day.

None of these changes would alter the year 2005 findings regarding any of the Federal Aviation Administration's criteria for marginal or significant effects.

Post-Closure

Under Alternative 1, the Jackson Hole Airport would close in 2033. At that time, all airport-related sound would end. The change would be measurable throughout the 71% of the park in which aircraft sound is audible, but would be most apparent in the areas close to the airport (see the Appendix G figures). Closure of the airport would have a long-term, beneficial impact on the natural soundscape of the park by eliminating sound from airport-related aircraft and ground operations.

Cumulative Impacts

The cumulative effects analysis examined the incremental impacts of Alternative 1 on the natural soundscape condition of the park, which already is affected by non-airport-related sound sources, and could be affected in the future by technological changes.

Flights by transient aircraft represent an existing sound source that would continue regardless of the status of the Jackson Hole Airport. These aircraft include both scheduled passenger and general aviation aircraft passing over or near the park at varying altitudes. In general, transient aircraft are audible 5% to 10% of the time at sound levels that typically are below 40 dBA and rarely are greater than 55 dBA. These sounds represent an adverse effect on the natural soundscapes of the park. In some areas of the park, such as the north and west portions of the Mountain Zone, sounds from transient aircraft may be the only non-natural sound that occurs. In other parts of the park, such as in developed areas or along road corridors, these aircraft sounds may be masked or joined by other non-natural sounds.

The interagency helibase, operated by the National Park Service and U.S. Forest Service from a location north of the development subzone at the Jackson Hole Airport, would continue operating at least until 2015 and perhaps until 2033. By 2033, the helibase would be relocated to another area, either in or outside the park. Regardless of location, helicopter operations over the park would continue. These aircraft operations, which are associated with fire suppression, search and rescue, research, and resource management, would adversely affect the natural soundscapes of the park.

Highway traffic would continue to be an important sound source in the park, especially along road corridors and in developed areas. Vehicle traffic on U.S. Highway 26/89/191 is busy, especially during the summer when an average of 8.4 vehicles per minute travel along some sections of the route (NPS 2005c). At this level, road vehicles are audible nearly 100% of the time along the road corridor and in pullouts. Unpublished data from the National Park Service show that in the turnouts along U.S. Highway 26/89/191, the sound level from a diesel truck 50 feet away traveling at 55 miles per hour can be up to 83 dBA. Other sources that contribute to the cumulative sound levels in and near road corridors and developed areas include automobiles and motorcycles, car stereos, and human voices. Close to roads, and especially along major travel corridors, these sources result in adverse effects on the natural soundscape.

Adverse impacts on the natural soundscape occur on and near Jackson and Jenny Lakes, where motorized watercraft are used during the summer, and in areas used by snowmobiles and snow coaches during the winter. These impacts would continue regardless of the status of the airport.

In all of these areas, sound from sources not related to the airport could mask the sounds of aircraft, thereby decreasing the percent of time in which aircraft were audible, but would add additional sounds to the soundscape. For example, at the busy park headquarters in Moose Village, aircraft sound would not be audible until the plane was close enough that its sound exceeded the sound from other sources. Listeners might then suddenly be aware of a “loud” aircraft sound that would fade as quickly. Natural sources of sound, such as a cascading waterfall, could create the same effect.

The future development and deployment of quiet-technology aircraft will likely have a beneficial effect on the natural soundscapes of the park. However, the modeling that was done for the soundscape analysis was based on aircraft that are currently available. Therefore, the model results may somewhat overstate the sound effects of aircraft, particularly by 2025.

Cumulatively, sound from all of these sources are not expected to increase from levels that currently are occurring, and may decrease as quieter engines are introduced to the existing fleet of motorboats, transient aircraft, and trucks. The decreases in sound in the park that would result from implementing Alternative 1 would contribute to the trend of achieving a more natural soundscape in parts of Grand Teton National Park.

Other airports in the region could be affected by the implementation of Alternative 1. Ending scheduled passenger service at the Jackson Hole Airport would increase demand at other airports, particularly in Idaho Falls and Salt Lake City. Closure of the Jackson Hole Airport in 2033 would displace general aviation to other private and public airports throughout the region. This would add to the noise impacts in those locations.

Conclusions

Alternative 1 would decrease the percent of the park in which sound from airport-related aircraft would be audible more than 10% of the time (would make the park quieter). However, because these aircraft would continue to be audible 10% or more of the time in about 20% of the park in both 2015 and 2025, the airport would continue to have a major, direct, long-term, adverse impact on the park’s natural soundscape. The southern part of the park, particularly areas within a few miles of the airport, would be most affected. With increasing distance from the airport and flight paths, aircraft sounds would diminish to the point of being a negligible impact.

Maximum sound levels at most points in the park would be similar to those occurring in 2005. However, in 2015 and 2025, an additional 7% of the modeled points in the park would experience maximum sound levels greater than 60 dBA, compared to the baseline.

The 15-hour energy-average sound level (Leq) which, because of the curfew, effectively represents the day-night average sound level (DNL), would be little changed compared to the baseline. The DNL would remain within the requirements stipulated in the 1983 agreement.

Compared to the 2005 baseline, there would be little change in 2015 or 2025 regarding the percent of the time above 60 dBA at locations in the park, effects on the natural soundscape in the park’s recommended wilderness, or sound impacts outside the park.

When the airport closed in 2033, its effects on the natural soundscape of the park would cease. Sound levels outside the park north of Jackson would decrease. Areas around the airports that received increased use because of the air traffic that was displaced from the Jackson Hole Airport would experience increased noise impacts.

The 1983 agreement established an upper bound on the amount of noise exposure that would be allowed as a result of the operation of the airport, and would not result in a significant impact on the park. Since 1983, the Jackson Hole Airport Board has operated the airport in compliance with the terms and conditions of the agreement, and the noise impacts on the park have remained below the levels authorized in the agreement.

In preparing this environmental impact statement 27 years after the 1983 environmental assessment, the National Park Service used an array of metrics to assess the noise effects on the park, and reevaluated what constitutes a significant, or major, impact with respect to the requirements of the National Environmental Policy Act. The process of measuring the noise impacts with multiple metrics does not alter the magnitude of the impacts, but facilitates understanding the impacts in different ways. Similarly, characterizing the noise impacts as major, or significant, reflects an evolution in the NPS' policies and procedures under the National Environmental Policy Act, and the scientific understanding of natural soundscapes, but does not mean that the impacts are any greater than what was described when the agreement was signed in 1983. The noise impacts associated with operation of the airport have remained below the limits established in the agreement, and the terms of the agreement provide an enforceable mechanism for ensuring that the impacts will not exceed those limits.

The conclusion that the impacts of Alternative 1 on the natural soundscape of the park would be major and adverse is based on the evaluation of airport-related sound against a baseline of the park's natural soundscape, rather than as a change from current condition. The natural soundscape of the park is affected by many sources of non-natural sounds, such as the sounds of motor vehicles along, and in some cases long distances from, road corridors and developed areas. Thus, although the baseline for the analysis of the effects of the airport on the natural soundscapes of the park is a truly natural condition throughout the entire park for the entire day, such a condition does not actually exist. Rather, the analysis allows a comparison against an idealized condition.

The impact determination in this section is based on the *absolute* amount of the park affected by aircraft audibility of 10% or more, rather than the *change* in the amount of the park affected by that level of audibility. Therefore, since 20% of the park would have aircraft audibility of 10% or greater in 2025, the impact level is categorized as major and adverse. With respect to the change from current conditions, however, the area of the park affected by aircraft audibility of 10% or greater would *decrease*, from 24% in the 2005 baseline year, to 20% in 2025, a beneficial effect on the natural soundscape.

Chapter 1 describes the NPS' statutory requirements under the Organic Act to protect park resources from actions that would result in impairment. Selection of Alternative 1 would not result in impairment of the natural soundscapes of the park for the following reasons.

- The Jackson Hole Airport has operated in its present location since the 1930s, which was prior to the establishment of either Jackson Hole National Monument or the present-day Grand Teton National Park. When Congress established the park in 1950, it knowingly included the airport within the boundaries, creating a unique situation. The enabling statute for the park also provided that existing leases, permits, and licenses would continue. Over the years since the park was established, the airport and park have evolved together, under a series of special use permits and the current agreement.
- Earlier in 1950, the year of the park's establishment, Congress enacted the Department of the Interior Airports Act, authorizing the Secretary of the Interior to establish, regulate, and maintain airports within national parks when determined to be necessary, as was done in the 1983 agreement. That determination and other aspects of the 1983 agreement were challenged and upheld in a 1985 decision by the U.S. District Court for the District of Wyoming (*Sierra Club v. Watt,* Case No. C83-0406-B (D. Wyo. 1985)).

- The airport thus represents a unique activity, which has existed since before the park's creation and has specific legislative authorization, and its impacts must be understood in that context. While that in and of itself does not excuse the impacts of the airport, or entirely exempt them from the requirements of the Organic Act, it is not a new use that introduces changes to the park that have not been previously present. Because the soundscapes in the park have from the beginning been affected by the airport, the airport's soundscape impacts cannot be said to harm the specific purposes of the park or its integrity in the way that similar soundscape impacts might in another park. In the context of Grand Teton National Park, the airport's soundscape impacts are not the sort of impacts that are considered more likely to cause impairment.
- Most of the park would be substantially unaffected by aircraft sounds, which would occur infrequently and at low sound levels. During the summer peak season in 2025, aircraft would be audible less than 10% of the time in approximately 80% of the park, and less than 5% of the time in 65% of the park. Impacts would be lower during most of the year when there were fewer aircraft using the Jackson Hole Airport (see Figure 7). The number of aircraft operations during the winter peak season is approximately half the summer peak, and spring and fall operations are lower than during either peak.
- In most areas of the park where aircraft would be audible, the sound levels would be relatively low. In 2015, for the 81% of the park where aircraft sounds would be audible less than 10% of the time, 77% of the modeled points would have a maximum sound level lower than 60 dBA, and 65% would have a maximum sound level lower than 50 dBA. For those points where percent-time audible is modeled to be less than 10%, but maximum sound level is above 60 dBA, the average time above 60 dBA would be about 3 seconds per day. The corresponding figures for 2025 are very similar. A combination of factors, including the airport's location adjacent to the park boundary at the southern end of the park, the fact that aircraft are at progressively higher altitudes with distance from the airport, and the use of the airspace almost entirely for direct travel to and from the airport, result in the effects of Alternative 1 being most pronounced close to the airport and diminishing rapidly with distance.
- The effects of the airport are most pronounced in areas of the park where, for most visitors, their experience is characterized by motor vehicle travel on park roads or the highway, or activities within developed areas. In many park locations where effects of the airport are greatest, ambient sound levels, which mask the sound of aircraft to some degree, tend to be higher than the values used in the modeling. In these areas, the addition of airport-related sounds is small in comparison to other natural or non-natural sounds that are ubiquitous, including those of motor vehicles.
- The effects of the airport on the natural soundscapes of the park are constrained by the terms of the 1983 agreement, which establishes specific upper bounds on aircraft noise that may not be exceeded. The cumulative noise requirements as expressed in the limitations on the size and configuration of the contours for a day-night average sound level (DNL) of 45 and 55 dBA, as well as the single-event noise limits, represent an upper bound on noise exposure. Furthermore, the airport's noise abatement plan includes enforceable mechanisms, such as the limits on average daily departures, that ensure that park resources and values are adequately protected from noise exposure.

Although a large area of the park would be affected to some degree, the magnitude of those effects at any point throughout most of the park would be small, particularly those parts of the park that are key to its enjoyment by park visitors. Thus, the adverse impacts, while major in intensity based on the impact thresholds, would not rise to the level of impairment.

VISITOR USE AND EXPERIENCE

This section describes the potential impacts of airport operations on park visitors and visitation patterns to Grand Teton National Park. It considers visitor activities, attitudes, and other factors important to understanding the impacts of the Jackson Hole Airport on opportunities for enjoyment of the park. See Chapter 3 for a description of these factors.

The geographic area evaluated for impacts on visitor use and experience included the lands within the park boundary, delineated by management zones. However, the analysis of the role of the airport in providing access to other recreation in the area, such as ski resorts, national forests, and other national parks, also considered the effects throughout Teton County.

The analysis of impacts of airport operations on visitor use and experience mostly focuses on the impacts of non-natural sounds from the airport on the quality of visitor experience. The physical impacts of sounds associated the airport and associated aircraft operations that would result from each alternative were described in the "Natural Soundscape" section of this environmental impact statement. It is important to distinguish between the *physical* characteristics of the soundscape (measurable properties, such as percent of the time that aircraft are audible and sound levels in dBA) and how those characteristics, or changes to them, may affect the experiences of park visitors. This section addresses the latter topic.

Other visitor use and experience issues identified during scoping and public comment that are addressed in the impact analysis include:

- Effects on the general character of the experience of a national park for the people using the park.
- Effects of sound on the frontcountry versus the backcountry experience, including the expectation for natural quiet in a national park.
- Effects on in-park recreation related to sounds.
- Cumulative effects on the national park experience in conjunction with all other projects on public and private lands in the vicinity.

Scoping also identified concerns about effects on the ability of visitors to come to the area so they could take part in area activities, including visiting Grand Teton National Park and participating in winter sports. The "Surface and Air Transportation" section addressed this concern under the heading "Community Access by Air Travel." Scoping comments also indicated concern about non-park recreation in the area, such as ski areas outside the park. The analysis of effects on recreation that is occurring outside Grand Teton National Park was included in the "Socioeconomics" section in this chapter. Finally, visual impacts of airport operations that may impact visitor experience are discussed in the "Visual Quality and Dark Skies" section in this chapter.

Regulations and Policies

Current laws and NPS policies indicate the following desired conditions in the park with regard to visitor use and experience relative to the presence and operation of the Jackson Hole Airport. In addition, three requirements regarding sound levels are associated with provisions of the 1983 agreement. These are described under "Permits and Agreements Authorizing the Jackson Hole Airport" in Chapter 1.

Desired Condition	Source
Grand Teton National Park resources are conserved unimpaired for the enjoyment of future generations. The National Park Service does not allow any activities that would cause derogation of the values and purposes for which Grand Teton National Park was established except as directly and specifically provided by Congress.	Organic Act General Authorities Act *Management Policies 2006* (NPS 2006a)
Opportunities are provided for appropriate, high-quality public enjoyment. Visitors have the opportunity to enjoy the superlative natural resources found in Grand Teton National Park. This includes having ample opportunity for inspiration, appreciation, and enjoyment through personalized experiences.	Organic Act General Authorities Act *Management Policies 2006* (NPS 2006a)
Human activities do not unreasonably interfere with the atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within Grand Teton National Park.	*Management Policies 2006* (NPS 2006a)
Natural sounds form a valued part of the visitor experience. The natural quiet and natural sounds associated with the physical and biological resources of Grand Teton National Park are preserved. The National Park Service will restore to the natural condition wherever possible those park soundscapes that have become degraded by unnatural sounds (noise), and will protect natural soundscapes from unacceptable impacts.	*Management Policies 2006* (NPS 2006a)
The National Park Service works constructively and cooperatively with the Federal Aviation Administration to ensure that authorized aviation activities affecting Grand Teton National Park do not cause unacceptable impacts on park resources and values and visitor experiences. Aviation operations are conducted in accordance with Federal Aviation Administration advisories, and "fly-friendly" techniques and procedures help pilots minimize impacts on Grand Teton National Park.	*Management Policies 2006* (NPS 2006a)

Methods

Impacts on visitor use and experience were evaluated using the process described in the "Methods for Analyzing Impacts" section. Impact threshold definitions for visitor use and experience are as follows.

Negligible: Changes in visitor use and the visitor experience would not occur. There would not be any perceived change in visitor experience or in defined indicators of visitor satisfaction or behavior.

Minor: Changes in visitor use and/or experience would be small but detectable. Visitors could be aware of the effects, but the changes would not appreciably alter critical characteristics (considered to be viewing of scenery and wildlife, and experiencing solitude or quiet) of the visitor experience, visitor satisfaction, or levels of use at park facilities.

Moderate: Some changes in critical characteristics (considered to be viewing of scenery and wildlife, and experiencing solitude or quiet) of the park experience would be readily apparent, or the number of visitors engaging in an activity or in the use of areas within the park would be substantially altered. Most visitors would be aware of changes, and many would be able to express an opinion regarding the difference. Visitor satisfaction would change as a result of the impact.

Major: Changes in multiple critical characteristics (considered to be viewing of scenery and wildlife, and experiencing solitude or quiet) of the desired experience would be readily apparent. Most visitors would be aware of the effects and would likely express a strong opinion about the changes. Participation in desired experiences or in park visitation would be considerably altered, and would result in substantial changes in the defined indicators of visitor satisfaction or behavior.

Short-term: Effects on visitor enjoyment and recreational or educational opportunities would be associated with a discrete activity with a defined term, such as construction or a treatment action. The effect would end concurrent with or shortly after the end of the specified activity.

Long-term: Effects on visitor enjoyment and recreational or educational opportunities would not be associated with a discrete activity with a defined term, and the effects of the change would be evident for a period exceeding five years.

The baseline for measuring the degree of change, or impact, of Alternative 1 on visitor use and experience from airport-related sounds is the current condition as described in the "Affected Environment" for visitor use and experience in Chapter 3.

Analysis

The park does not have any survey data specifically on visitor perceptions and attitudes regarding the presence of the airport within the park. However, other surveys and methods used to collect and measure visitor experience and satisfaction have not identified that the airport adversely affects the use and enjoyment of the park (Littlejon 1997 and 1998; Smaldone 2001; Braak *et. al* 2009). In fact, surveys taken over the past 10 years have consistently indicated an extremely high level of visitor satisfaction with experiences in Grand Teton National Park. Factors contributing to that high level of visitor satisfaction would not change under this alternative. They include outstanding opportunities for scenic and wildlife viewing and recreation, the number and type of activities available, the condition of park facilities and roads, and the positive interactions with park staff and other visitors.

In addition to the factors cited above, visitor use and experience is influenced by the presence or absence of natural sounds and non-natural sounds as described in Chapter 3. For many visitors, the effect of airport-related sounds on the quality of their experience would continue to be context-sensitive under this alternative.

Three management zones were identified in the park as part of the 1976 master plan (NPS 1976) and are used in this analysis, including the Mountain Zone, Valley Zone, and Through Zone (shown on Figure 8). The Through Zone bisects the Valley Zone and includes U.S. Highway 26/89/191 and all associated roadside turnouts and junctions, the Moose area, and some visitor service facilities in the northern part of the park. Surveys show that most visitors use the developed areas of the park in the Through Zone and Valley Zone, including Moose (46%), Jenny Lake (70%), and Colter Bay (48%) (Braak *et. al* 2009), where the expectation of experiencing natural soundscapes may be lower, and the presence of non-natural sounds may be higher.

Within each zone, there is a different visitor experience level and a different expectation or degree of awareness regarding the natural soundscape and non-natural sounds. For instance, there is a greater prevalence of and expectation for non-natural sounds at Moose than there is at a backcountry trailhead within the Mountain Zone. This condition is related to the presence of vehicles and roads, the Craig Thomas Discovery and Visitor Center, and the park administrative headquarters area. Backcountry visitors, who likely have a greater expectation of natural soundscapes, probably would be more sensitive to non-natural sounds and, thus, would be more affected by the presence of airport-related sound than visitors at a roadside turnout along U.S. Highway 26/89/191 or at the Discovery and Visitor Center in Moose.

As described in the "Natural Soundscape" section, airport-related sounds are not audible in some parts of the park. This particularly is true in the Mountain Zone, where 52% of all points had year 2005 airport-related aircraft audibility values of zero. Because Alternative 1 would decrease the percent of the park in which these aircraft could be heard, all of these points would continue to have audibility values of zero. Therefore, in these areas, Alternative 1 would have a negligible impact on visitor use and experience in 2015, 2025, and after the airport closed in 2033.

The impacts of the airport on the natural soundscape of the park are generally greatest in areas where most visitors would have lower expectations for natural soundscapes, because of the presence of development or transportation corridors and the sounds associated with those facilities. The area of the park most affected by the presence of the airport in terms of percent-time audible and maximum sound level is the southern part of the valley between Moose and the south boundary, within the Through Zone. While this area of the park experiences high levels of visitation, most of it occurs in places where there would be an expectation of non-natural sounds, such as along U.S. Highway 26/89/191, in the Moose developed area, or at the airport itself. In addition, the non-natural sounds associated with these areas also tend to mask the sounds of more distant aircraft. Thus, for many visitors, the decrease and ultimate absence of airport-associated sounds that would result from Alternative 1 would take place against the backdrop of substantial levels of other non-natural sounds.

Campers staying at the Jenny Lake Campground or the Gros Ventre Campground in the Valley Zone could experience sound levels that may cause sleep interruption (maximum modeled values of 46 dBA and 64 dBA, respectively). However, impacts to sleep at night would be mitigated by the airport curfew hours of 11:30 P.M. to 6:00 A.M. and the fact that most airport operations occur between 7:00 A.M. and 10:00 P.M. (see Figure 6).

During daytime hours, park ranger interpretive programs occur year-round at the Craig Thomas Discovery and Visitor Center, and during the summer at the Jenny Lake visitor services area and Colter Bay. Aircraft sounds at these locations may be loud enough to interrupt conversation for short durations. Sixty dBA is the sound level of a normal conversation at 5 feet, and a level that likely would cause speech interference (see the Acoustic Primer in Chapter 3), but levels above 52 dBA could affect ranger interpretive programs in a national park setting (U.S. Environmental Protection Agency 1974). While single sound events may cause interruption for only a few seconds, the aggregate number of interruptions during an interpretive program in the peak season may be perceived negatively by visitors, even in the presence of other non-natural sounds.

Interpretive programs also are presented during summer daytime hours at the Laurance S. Rockefeller Preserve. Because the modeled maximum sound levels of 45 dBA at this facility are below the 52 dBA threshold, there is less potential for programs and conversations to be adversely affected. However, some visitors may perceive minor impacts if they have high expectations of natural sound because of the preserve's forested and lakeside environment, lower visitor numbers, and emphasis on contemplating nature and the sensory aspects of the natural world.

The Murie Ranch is located in the Valley Zone, as described in Chapter 3. This National Historic Landmark is about a half-mile south of the Craig Thomas Discovery and Visitor Center. Aircraft sound at this location would be loud enough to interfere with conversation (maximum modeled sound level of 72 dBA during the peak season in both 2015 and 2025), but the total aggregate amount of time above 60 dBA would be only about a minute per day. Some visitors may have a higher expectation of experiencing a natural soundscape at the Murie Ranch because of the historic nature of the site and its location in a wooded area south of Moose. Therefore, airport-related and other non-natural sounds may continue to be perceived negatively by visitors and could adversely affect their experience.

Consultation with the Wyoming state historic preservation officer included analyzing potential airport-related sounds relative to the designation of the Murie Ranch as a national historic landmark.

This analysis showed that aircraft audibility did not have an adverse affect on the characteristics for which the property was nominated. This finding received concurrence by the Wyoming state historic preservation officer (see Chapter 1 under "Impact Topics Dismissed from Further Consideration, Cultural Resources" and the correspondence in Appendix A).

Under Alternative 1, scheduled passenger service at Jackson Hole Airport is assumed to end by 2015, and sounds from these flights would cease. Sounds from general aviation and other sources of non-natural sounds would continue. The impacts of this change in terms of maximum sound levels, percent-time audible, 15-hour energy-average sound levels, and time audible at or above a level that interferes with normal conversation are described in the "Natural Soundscape" section. Compared to current conditions, the impact on visitor experience after 2015 would be beneficial, minor, and would be unlikely to affect any critical characteristics of the visitor experience, visitor satisfaction, or levels of use at park facilities in any of the management zones.

In 2033, the Jackson Hole Airport would close, and all airport-related sounds would cease, resulting in beneficial effects on the natural soundscape of the park. Impacts to visitor experience after the airport closure would also be beneficial; however, the degree would depend on the management zone, audibility of other sources of sounds, and expectation level for natural soundscapes. Within the Through Zone, beneficial direct impacts are anticipated to be minor, while impacts in the Mountain Zone could be moderate.

- In the Through Zone at Moose, the impacts on visitor experience probably would be less than at the Lupine Meadows trailhead in the Mountain Zone because of differing expectations of experiencing the natural soundscape and sensitivity to non-natural sounds. Visitors to the Mountain Zone may perceive more of natural sounds (or conversely, less non-natural sound) and, thus, may experience a higher degree of beneficial direct impact than those in the Through Zone who already hear other non-natural sounds, have an existing low expectation of natural sounds, and may not notice the absence of airport-related sounds.
- Visitors within the Valley Zone, which includes Moose-Wilson Road, Teton Park Road, and visitor services at Jenny Lake, would experience a range of impacts, depending on their location within the zone. For instance, a visitor would likely have a lower expectation of natural sounds and a lower sensitivity to aircraft sounds at the Jenny Lake boat dock than at Phelps Lake at the Laurance S. Rockefeller Preserve. Thus, impacts in this zone would range from minor to moderate.

Airport-related sound decreases with distance from the airport. Thus, impacts on visitor experience would correspondingly decrease farther from the airport.

Impacts of Alternative 1 on visitor use and experience relative to airport-related sound in the park's recommended wilderness would be beneficial, direct, and of negligible or minor intensity. Visitor expectations for natural sounds and sensitivity to non-natural sounds would generally be the highest in the recommended wilderness. As described in the "Natural Soundscapes" impact analysis, there would be a small, perceptible decrease in airport-related sounds in some parts of the recommended wilderness. However, the difference would not cause any change in the critical characteristics of the visitor experience or use of park facilities. After 2033 when the airport would close, there would be no airport aircraft sound impacts in the recommended wilderness in the park. The change might be noticed by some visitors if they had experienced airport-related sounds on a prior visit. First-time visitors would likely not notice the change.

Maximum modeled sound levels at the Laurance S. Rockefeller Preserve, which is mainly in the Mountain Zone, would decrease from 58 dBA in 2005 to 45 dBA in both 2015 and 2025. The all-year percent-time audible (23%, or 14 minutes per hour) would decrease slightly to 22% (13 minutes per hour), but the peak-season time audible would remain essentially unchanged at 30% (18 minutes per hour). Like visitors to other parts of the Mountain Zone, visitors who have visited the preserve previously would not likely notice differences from previous trips to the preserve until after 2033, when the absence of airport-related sounds might be apparent.

The reduction and eventual elimination of sounds associated with the airport under Alternative 1 would likely have beneficial, minor to moderate, long-term, direct impacts on visitor use and experience, across all management zones. There would not likely be a readily apparent change in the critical characteristics of the visitor experience or use of park facilities, including outstanding opportunities for scenic and wildlife viewing and recreation, the number and type of activities available, the condition of park facilities and roads, and the positive interactions with park staff and other visitors. However, repeat visitors may notice a change in conditions relative to natural soundscapes and the absence of airport-related sound, depending on their location in the park.

Cumulative Impacts

Most of the area surrounding Grand Teton National Park is federally owned, including the Bridger-Teton National Forest, National Elk Refuge, and Yellowstone National Park. Only 3% of Teton County, Wyoming is in private ownership, and most of the private land is in the southern part of the county, particularly in and around Jackson. Visitors to the area, as well as local residents, often recreate on public lands throughout the area and the region.

The Bridger-Teton National Forest is updating its forest plan, which will guide its management of lands and resources. No changes in the general character of the region that would affect park visitor experiences are expected from the plan revisions. Oil and gas development south of Teton County, near Pinedale and Bondurant, could potentially change land uses and the natural soundscape of those areas, but is not expected to have any effect on visitor experiences in Grand Teton National Park.

Sound from aircraft transiting the area, but unrelated to the Jackson Hole Airport, would continue to be audible within the park. Sound levels from these aircraft, which typically peak around 30 to 40 dBA for aircraft flying at altitudes between 20,000 and 40,000 feet, may be perceived by some visitors, particularly those in areas where other sources of natural or non-natural sound are absent. Transiting aircraft would continue to be audible 5% to 11% of the time, as shown in the Table 6 values for park locations north of the Signal Mountain area.

Improvements in aviation technology may result in quieter engines on most aircraft. Such changes could reduce sound levels from aircraft, including those using the Jackson Hole Airport and those transiting the park. All of the analyses presented here are based on flight routes and sound profiles of the aircraft models currently in use. Advances in aircraft technology and potential future changes to air traffic control could substantially reduce the amount of sound exposure for the park and surrounding areas, but these factors were not included in this analysis. Such improvements would have long-term, beneficial impacts of minor intensity on visitor experience.

Conclusions

During the general aviation period from 2015 to 2033, non-natural sounds from scheduled passenger aircraft would be absent, resulting in direct, negligible to moderate, long-term, beneficial impacts on visitor experience. After the airport closed in 2033, all sounds associated with the Jackson Hole Airport would cease, resulting in direct, negligible to moderate, long-term, beneficial impacts on the experience of park visitors. The degree of impact would depend on individual visitor expectations as well as their location in the park relative to the airport.

AIR QUALITY

Regulations and Policies

Air quality regulations of the U.S. Environmental Protection Agency and State of Wyoming that apply to all emissions of air pollutants in the state were summarized in the "Affected Environment" section. In addition, NPS policies indicate the following desired conditions in Grand Teton National Park with regard to air quality relative to the presence of the Jackson Hole Airport.

Desired Condition	Source
The National Park Service seeks to perpetuate the best possible air quality in Grand Teton National Park to preserve natural resources and systems; preserve cultural resources; and sustain visitor enjoyment, human health, and scenic vistas. This includes actively promoting and pursuing measures to protect park values from the adverse impacts of air pollution.	Clean Air Act *Management Policies 2006* (NPS 2006a)
Actions are consistent with affirmative responsibilities related to Grand Teton National Park's Class I designation under the Clean Air Act. This includes remedying any existing and preventing any future human-made visibility impairment.	Clean Air Act *Management Policies 2006* (NPS 2006a)
All air pollution sources in Grand Teton National Park comply with all federal, state, and local air quality regulations and permitting requirements.	Clean Air Act *Management Policies 2006* (NPS 2006a)
Visitors and employees are notified when air pollution concentrations within an area exceed the national or state air quality standards established to protect public health.	*Management Policies 2006* (NPS 2006a)
The National Park Service effectively participates in decision-making that affects park air quality. This includes inventorying the park's air-quality-related values; monitoring and documenting the condition of air quality and related values; evaluating air pollution impacts and identifying causes; minimizing air quality pollution emissions associated with park operations; and ensuring healthful indoor air quality.	*Management Policies 2006* (NPS 2006a)
The National Park Service seeks the cooperation of others in minimizing the impacts of influences originating outside Grand Teton National Park to improve air quality.	*Management Policies 2006* (NPS 2006a)

Air quality is subject to standards and guidelines established under federal and state regulations implementing the Clean Air Act, and guidelines from the National Park Service and other federal land management agencies. Throughout this section, the evaluation of future conditions under each of the alternatives were assessed against the criteria in Table 34 to determine compliance with regulatory standards and guidelines.

TABLE 34: CRITERIA USED TO DETERMINE THE IMPACTS ON AIR QUALITY FROM THE JACKSON HOLE AIRPORT [a]

			Prevention of Significant Deterioration Increment Concentration		Significant Impact Levels	
Pollutant	Averaging Period	National / State Ambient Air Quality Standards	Class I Areas	Class II Areas	Class I Areas [b]	Class II Areas
Sulfur dioxide	3-hour	1,300 $\mu g/m^3$ [c]	25 $\mu g/m^3$	512 $\mu g/m^3$	1 $\mu g/m^3$	25 $\mu g/m^3$
	24-hour	260 $\mu g/m^3$	5 $\mu g/m^3$	91 $\mu g/m^3$	0.2 $\mu g/m^3$	5 $\mu g/m^3$
	Annual average	60 $\mu g/m^3$	2 $\mu g/m^3$	20 $\mu g/m^3$	0.1 $\mu g/m^3$	1 $\mu g/m^3$
Particulate matter (10 microns or less)	24-hour	150 $\mu g/m^3$	8 $\mu g/m^3$	30 $\mu g/m^3$	0.3 $\mu g/m^3$	5 $\mu g/m^3$
	Annual average	--	4 $\mu g/m^3$	17 $\mu g/m^3$	0.2 $\mu g/m^3$	1 $\mu g/m^3$
Particulate matter (2.5 microns or less)	24-hour	35 $\mu g/m^3$	8 $\mu g/m^3$ [d]	8 $\mu g/m^3$ [d]	0.3 $\mu g/m^3$ [d]	5 $\mu g/m^3$ [d]
	Annual average	15 $\mu g/m^3$	4 $\mu g/m^3$ [d]	4 $\mu g/m^3$ [d]	0.2 $\mu g/m^3$ [d]	1 $\mu g/m^3$ [d]
Nitrogen dioxide	Annual average	100 $\mu g/m^3$	2.5 $\mu g/m^3$	25 $\mu g/m^3$	0.1 $\mu g/m^3$	1 $\mu g/m^3$
Carbon monoxide	1-hour	40,000 $\mu g/m^3$	--			2,000 $\mu g/m^3$
	8-hour	10,000 $\mu g/m^3$	--			500 $\mu g/m^3$
Lead	Rolling 3-month average	0.15 $\mu g/m^3$	--			
Total sulfur deposition	Annual	0.005 kilograms /hectare/year [e]	--	--	--	--
Total nitrogen deposition	Annual	0.005 kilograms /hectare/year [e]	--	--	--	--
Visibility: color	1-hour	2 [f]	--	--	2 [f]	--
Visibility: contrast	1-hour	0.05 [f]	--	--	0.05 [f]	--

a/ Except as noted, criteria pollutant standards, increments, Class II significant impact levels, and visibility standards are from the U.S. Environmental Protection Agency (2010c) or Wyoming Department of Environmental Quality (2006). A double dash indicates that there is no criterion for this pollutant for this standard.

b/ Class I significant impact levels were provided by Andrea Stacy of the NPS' Air Resources Division in a September 21, 2009 email.

c/ $\mu g/m^3$ = micrograms per cubic meter.

d/ Some standards or criteria for particulate matter with diameters of 2.5 microns or less have not yet been established by the U.S. Environmental Protection Agency or Wyoming Department of Environmental Quality. Therefore, based on a suggestion from the Wyoming Department of Environmental Quality and National Park Service, this criterion for this pollutant is the same as the standard for particulate matter with diameters of 10 microns or less.

e/ Sulfur and nitrogen deposition analysis thresholds of 0.005 kilograms per hectare per year are from the Federal Land Managers' Air Quality Related Values Workgroup (2010).

f/ Visibility criteria do not have units. The "color" value indicates the perceptibility of emissions based on color differences and brightness. The "contrast" value is a change in a spectral criterion defined for a green wavelength of 0.55 microns.

Methods

Modeling

Air quality modeling was used to assess and document impacts of airport operations and emissions in both the Class I and nearby Class II areas. Modeling included analyses of:

- Impacts of criteria pollutant emissions, including lead, relative to the National Ambient Air Quality Standards;
- Impacts of criteria pollutant emissions relative to Class I and Class II significant impact levels in the respective area types;
- Impacts relative to Class I and Class II Prevention Of Significant Deterioration increments for those criteria pollutants for which such increments are established; and
- Impacts on air quality related values in the Grand Teton National Park Class I area, including impacts on visibility and deposition rates of nitrogen and sulfur at potentially sensitive lakes in the park, as identified by Nanus *et al.* (2005).

The U.S. Environmental Protection Agency suggested models and methods for executing the analyses. Modeling guidance was provided by the National Park Service, U.S. Environmental Protection Agency, and Wyoming Department of Environmental Quality – Air Quality Division.

The modeling protocol and technical report for the air quality impact assessment are presented in Appendix H. A brief description of the modeling inputs and analyses are provided below.

Only the sources on airport property were examined in the modeling analysis. All other sources inside and outside Grand Teton National Park were represented by the background values used in the model. This use of estimated emissions related to airport use *plus* actual regional values results in an overestimate of air pollutant concentrations relative to standards, because the regional background data already include existing airport emissions.

The analysis involved employing the following models:

- Federal Aviation Administration Emissions and Dispersion Modeling System model (version 5.1 – September 2008);
- U.S. Environmental Protection Agency AERMOD dispersion model, Version 09292, which is incorporated in the impact component of the Emissions and Dispersion Modeling System; and
- U.S. Environmental Protection Agency VISCREEN visibility screening model.

The current and projected future airport operating levels and aircraft types that were used for air quality modeling were the same as those used in the natural soundscape analysis. These values are presented in Tables 8 and 33. As with sound, modeling for air quality employed annual average operations at the airport and a July through September peak-season period, and modeled for a baseline period of October 2004 through September 2005 and two future years, 2015 and 2025. Reasonable worst-case values that were compared to the short-term standards (24 hours or less) were modeled using peak-season operations (about 150 per day).

No attempts were made to forecast or model the period beyond 2025, as future values are highly uncertain. Because changes in the economy, geopolitical situation, and technology sector often have unforeseeable effects on the aviation industry, the Federal Aviation Administration (2006c) typically extends its annual *FAA Aerospace Forecasts* only for 12 years. The values for the airport operations forecasts used in this air quality analysis (as in the natural soundscapes analysis) for 2025 represent best professional judgment, but estimates beyond 2025 would have such a high degree of uncertainty as to be too speculative.

Impacts under Alternative 1 in 2015 and 2025 were determined by comparing the emissions values (or appropriate parameter) to the corresponding values produced by the model for the existing 2005 baseline conditions data. Alternative 2 impacts in 2015 and 2025 were developed by comparing impacts under Alternative 2 to those under Alternative 1.

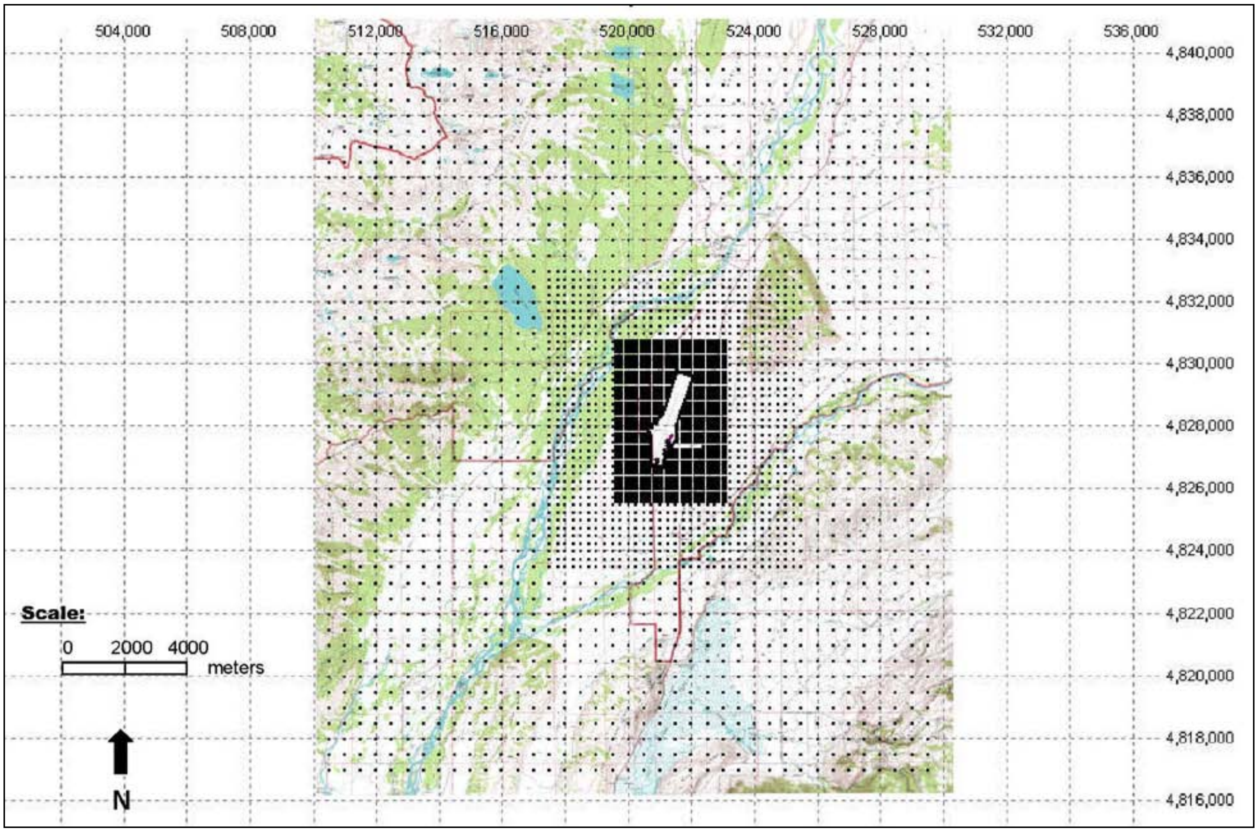
The protocol in Appendix H identified data types that were used for modeling. The values that were used are provided in the air quality technical report in the same appendix. In addition to the aircraft operations data in Tables 8 and 33:

- Emissions from mobile sources on airport roads and parking areas were calculated based on physical layout and quantified levels of activity, including numbers and types of vehicles.
- The numbers and models of airport point sources (generators and boilers) were inventoried. Current modeling used the same assumptions that were employed in the 2000 emissions inventory for Grand Teton National Park (EA Engineering, Science, and Technology, Inc. 2003). These included full-load, full-time operation of each boiler (8,760 hours per year) and operation of each generator for 500 hours each year.
- Jackson Hole Airport operational staff provided information on the types of ground support equipment employed onsite, and hours of daily use on an annual and peak-season basis.
- Facility plot plans and building engineering drawings were used in the U.S. Environmental Protection Agency's most recent generation of the Plume Rise Model Enhancement (PRIME) building downwash algorithms. "AERMOD-PRIME" was invoked to account for any potential building-induced aerodynamic wake effects on plume dispersion from the vertically discharged point sources.
- Meteorological data were provided by the Wyoming Department of Environmental Quality. These consisted of Jackson Hole Airport hourly surface weather observation data for the five-year period 2004 through 2008, coupled with corresponding upper-air data from Riverton, Wyoming. The full 5-year data record was used for sequential modeling analyses for the National Ambient Air Quality Standard increment, deposition analyses, and significant impact area determination based on the significant impact levels.
- U.S. Geological Survey 7.5-minute digital elevation model files of topographic maps provided the receptor terrain heights and were used to calculate the "height scale" and "critical dividing streamline height" parameters for each receptor.

Lead has been banned from automobile fuel since 1996, but continues to be used as an octane booster in fuel for piston-engine aircraft. Because general aviation traffic at the Jackson Hole Airport includes piston-engine aircraft, emissions from use of leaded fuel were calculated to determine compliance with the National Ambient Air Quality Standard. Lead emissions were calculated indirectly by the Emissions and Dispersion Modeling System by rerunning the model for piston engine aircraft only, and then using the known amount of lead content in avgas along with the pounds of fuel burned to derive maximum rolling 3-month average lead emissions.

A base receptor grid was used for the National Ambient Air Quality Standard, increment, and significant impact level analyses. This grid, which is shown in Figure 23, was 19 kilometers (11.8 miles) from east to west, and 23 kilometers (14.3 miles) from north to south. It consisted of 4,338 receptor points that included both the Class I and Class II areas around the airport.

FIGURE 23: FULL RECEPTOR GRID USED FOR DETERMINING AIR QUALITY IMPACTS



The grid was intended to include the maximum radius of significant impact for any pollutant and averaging period, and it was thought that it would cover the entire area surrounding the airport within which predicted impacts would exceed the most stringent significant impact level. Spatial densities followed recommendations from the Wyoming Department of Environmental Quality and ranged from 50-meter (about 165-foot) spacing along the airport boundary fence to 1-kilometer spacing (0.6-mile) from 10 kilometers (6.2 miles) from the airport fence to the outer edge of the grid. Other receptors included:

- Base grid subdivisions within the model to segregate Class I and Class II areas;
- A set of discrete receptors representing the lakes of concern (from Nanus *et al*. 2005) for the nitrogen and sulfur deposition analysis; and
- Defined receptor points (that is, source-observer distances) for the VISCREEN analysis.

The visibility analysis using VISCREEN used two source-observer distances. They include a minimum of 1 kilometer (0.6 miles, the approximate distance to the central emissions point on the airport from the airport fence line) and a maximum of 18 kilometers (about 11 miles, such as the distance to the Grand Teton Peak from U.S. Highway 26/89/191 viewing points close to the airport). An annual average background visual range value of 248 kilometers (about 150 miles) was used in the VISCREEN analysis. In addition, a "virtual point source" approach to the source characterization was used to address the screening approach's inability to handle multiple sources or source types.

Issues, Impact Thresholds, and Geographic Area

Impact threshold definitions for direct and indirect effects on air quality from airport and aircraft operations are based on four issues, which were raised in comments on the draft environmental impact statement:

- Emissions of criteria pollutants, including lead, which continues to be used in aviation fuel;
- The health effects, expressed as Air Quality Index, that would be associated with criteria pollutant emissions from airport operations and all other sources;
- Visibility; and
- Deposition of nitrogen and sulfur compounds that can acidify soils and water or increase the availability of nutrients.

The thresholds for impact intensity for direct and indirect effects on visibility and deposition, which are among the air quality related values protected under the Clean Air Act, do not represent "bright line" conditions. In accordance with NPS responsibilities under the Clean Air Act, impact determinations for these values are made on a case-by-case basis, taking into account the current conditions, project size, degree to which the screening thresholds are exceeded, and sensitivity of the receiving ecosystem to air pollution. While a modeled exceedence of a threshold for visibility or deposition indicates that impacts are more likely to be in a higher impact category (that is, moderate or major), this cannot be determined without first evaluating the intensity of the impact in the context of the other criteria. Further information on how case-by-case impact determinations should be made in accordance with NPS responsibilities under the Clean Air Act and Organic Act can be found in the phase I report from the Federal Land Managers' Air Quality Related Values Workgroup (2010).

Direct and indirect impacts under Alternative 1 were determined by comparing the emissions values (or appropriate parameter) for this alternative to the corresponding values produced by the model for the October 2004 through September 2005 baseline. Alternative 2 impacts were developed by comparing model results for Alternative 2 to those for Alternative 1. Intensity thresholds are presented below.

Negligible:

- Potential to emit each criteria pollutant would be less than 50 tons per year; and
- When emissions related to airport operations were added to emissions from other sources in the Jackson Hole area, the Air Quality Index value would be less than 50 at the airport boundary; and
- No perceptible visibility impacts likely (no visible smoke, plume, or haze based on modeling results below the threshold of perceptibility represented by a delta E of less than 2.0 and a plume contrast value of less than 0.05); and
- The change in deposition rate from the alternative would be less than 0.005 kilograms per hectare per year *each* for nitrogen and sulfur.

Minor:

- Potential to emit each criteria pollutant would be less than 100 tons per year; and
- When emissions related to airport operations were added to emissions from other sources in the Jackson Hole area, the Air Quality Index value would be less than 100 at the airport boundary; and

- Perceptible visibility impacts would occur, but would only be visible from a small area of the park, would occur less than one day per year, and would be visible to few park visitors on the day they occurred; and
- The change in deposition rate for nitrogen or sulfur from the alternative would not be sufficient to cause impacts to individual species in sensitive ecosystems, based on the critical load values reported in the scientific literature.

Moderate:

- Potential to emit each criteria pollutant would be less than 250 tons per year; and
- When emissions related to airport operations were added to emissions from other sources in the Jackson Hole area, the Air Quality Index value would be less than 150 at the airport boundary; and
- Perceptible visibility impacts would occur and would be visible from several areas of the park, would occur one to several days per year, or would be visible to many park visitors on the days they occurred; and
- The change in deposition rates for nitrogen or sulfur from the alternative would be sufficient to cause impacts to individual species in sensitive ecosystems, based on critical load values reported in the scientific literature.

Major:

- Potential to emit each criteria pollutant would be 250 tons per year or greater; or
- When emissions related to airport operations were added to emissions from other sources in the Jackson Hole area, the Air Quality Index value would be 150 or greater at the airport boundary; or
- Perceptible visibility impacts would occur and would be visible from many areas of the park, would occur many days per year, or would be visible to many park visitors on the days they occurred; or
- The change in deposition rates for nitrogen or sulfur from the alternative would be sufficient to cause changes to communities in sensitive ecosystems, based on critical load values reported in the scientific literature.

Short-term: Effects would occur only during and shortly after a specified action or treatment.

Long-term: Effects would persist well beyond the duration of a specified action or treatment, or would not be associated with a particular activity such as construction. Long-term effects also include events of short duration, such as the production of exhaust from an aircraft taking off or landing, that occur regularly, such as daily, over an extended period of time.

Geographical Area: The area considered for air quality effects generally included the southern part of Grand Teton National Park from about 9 miles south of the airport to viewpoints of Grand Teton Peak from along U.S. Highway 26/89/191 about 12 miles north of the airport. If different areas were used for some analyses, those areas are specifically defined.

Beneficial or Adverse: Impacts can be categorized as to whether the proposed action or alternative would have a beneficial or adverse effect.

Direct and Indirect Impacts: Direct impacts are defined as impacts that occurs as a result of the proposed action or alternative in the same place and at the same time as the action. And indirect impact is defined as a reasonably foreseeable impact that occurs removed in time or space from the proposed action.

Cumulative Impacts Analysis Method: The assessment of cumulative impacts on compliance with National Ambient Air Quality Standards, increment assessment, visibility, and deposition rates of nitrogen and sulfur involved adding contributions from airport operations to background air emissions from other sources to look at the total effect of the combined emissions on the environment. The impact thresholds defined above for direct and indirect effects do not apply to the cumulative effects analysis. The cumulative effects are analyzed in terms of whether the impacts would be beneficial or adverse and short-term or long-term.

Analysis

Direct and indirect impacts under Alternative 1 were determined by comparing the emissions values (or appropriate parameter) for this alternative to the corresponding values produced by the model for the October 2004 through September 2005 baseline. Emissions from implementing Alternative 1 would be lower in both 2015 and 2025 than emissions occurring during the project baseline. Therefore, on a relative basis, impacts from Alternative 1 would be less than the current condition. Details regarding impacts for each of the air quality factors of concern are provided below.

Effects on Emissions of Criteria Pollutants

The action to extend the agreement for the Jackson Hole Airport is not subject to review under Clean Air Act regulations for emissions of criteria pollutants relating to Prevention of Significant Deterioration permitting. However, a similar-type analysis for emissions of criteria pollutants was performed for each alternative to address comments from the U.S. Environmental Protection Agency regarding the draft environmental impact statement.

Table 35 presents the emissions of criteria pollutants, in tons per year, that would be associated with all activities at the Jackson Hole Airport under Alternative 1 in 2015 and 2025. As shown in the table, emissions in both periods would decrease relative to the emissions occurring during the modeled period of existing baseline operations from October 2004 through September 2005. As a result, impacts of implementing this alternative in both 2015 and 2025 would be beneficial, direct, and long-term, when compared with existing conditions. In 2015, emissions of all criteria pollutants would decline relative to the modeled existing conditions baseline because of the elimination of aircraft operations associated with scheduled passenger service. Decreases would range from about 20% for lead to 65% for nitrogen oxides. For 2025, there would be similar decreases as in 2015, relative to baseline (see Table 35). After 2033, all airport-related emissions of these criteria pollutants would cease.

TABLE 35: EMISSIONS OF CRITERIA POLLUTANTS IN TONS PER YEAR RESULTING FROM MODELED EXISTING BASELINE OPERATIONS AND EACH OF THE ALTERNATIVES

Criteria Pollutant	Modeled Existing Baseline	Alternative 1: No Action / Continue Current Agreement		Alternative 2: Preferred Alternative	
		2015	2025	2015	2025
Sulfur dioxide	23.3	6.5 (-16.8) [a/]	6.7 (-16.6)	13.6 (-9.7)	13.9 (-9.4)
Particulate matter (10 microns or less in diameter)	3.7	2.8 (-0.9)	2.8 (-0.9)	4.0 (-0.3)	3.9 (-0.2)
Nitrogen oxides	137.3	50.1 (-87.2)	48.7 (-88.6)	117.5 (-19.8)	115.5 (-21.8)
Carbon monoxide	549.8	384.9 (-164.9)	377.6 (-172.2)	484.1 (-65.7)	452.2 (-97.6)
Lead	0.05	0.04 (-0.01)	0.04 (-0.01)	0.04 (-0.01)	0.04 (-0.01)

a/ All values are in tons per year. Values in parentheses are differences from emissions of criteria pollutants from the modeled existing conditions baseline, which reflects actual airport operations from October 2004 through September 2005.

Effects on Ability to Meet National Ambient Air Quality Standards

Compliance with the National Ambient Air Quality Standards was determined by calculating the maximum predicted Jackson Hole Airport source impacts for each criteria pollutant and averaging period (such as 3-hour or annual) in the years 2015 and 2025 and summing them with the corresponding background concentration to obtain a total concentration. This value was compared to the standards in Table 34. It also was compared to the modeled existing conditions baseline that was developed using actual airport operations data from October 2004 through September 2005 to determine relative change. National Ambient Air Quality Standards compliance was assessed over the entire receptor grid (entire modeling domain) developed for the study area.

The results are presented in Table 36. As shown in the table:

- Emissions in both periods would decrease relative to the emissions occurring during modeled existing conditions baseline operations.
- Total predicted emissions plus background associated with Alternative 1 for all pollutants and averaging periods would be below the corresponding standards.
- Total impacts resulting from the National Ambient Air Quality Standards analysis would be dominated by the background concentration values rather than by emissions from the airport.
- Only the total 24-hour value for particulate matter with diameters of 2.5 microns or less would appreciably approach its corresponding standard. However, airport emissions would represent less than a third of the total, with background contributing the remainder.

Impacts would be beneficial because of the reduction in emissions in both 2015 and 2025, and because total predicted emissions would remain below standards for all pollutants. However, differences between 2015 and 2025, and between both of these periods and the modeled existing conditions baseline, would be small and would not be readily discernable from variations that occur because of climatologic variations among years.

After 2033, the airport would be closed. This would eliminate all emissions from airport-related sources, which would improve air quality relative to criteria pollutant emissions in the park.

TABLE 36: NATIONAL AMBIENT AIR QUALITY STANDARDS ANALYSIS FOR ALTERNATIVE 1 IN 2015 AND 2025

Pollutant	Averaging Period	Ambient Air Quality Standards (µg/m³)	Background [a/] (µg/m³)	Baseline Total [b/] (µg/m³)	Baseline Air Quality Index [b, c/]	2015 Airport Emissions (µg/m³)	2015 Total (µg/m³) [d/]	2015 Air Quality Index	2025 Airport Emissions (µg/m³)	2025 Total (µg/m³) [d/]	2025 Air Quality Index
Sulfur dioxide	3-hour	1,300	16.5	195.3	--	121.5	138.0	--	121.5	138.0	--
	24-hour	365	8.4	51.8	29	36.5	44.9	29	36.6	45.0	29
	Annual average	80	2.6	11.6	--	1.0	3.6	--	1.0	3.6	--
Particulate matter (10 microns or less)	24-hour	150	93.0	104.1	75	11.1	104.1	75	11.1	104.1	75
	Annual average	--	21.0	21.5	--	0.4	21.4	--	0.4	21.4	--
Particulate matter (2.5 microns or less)	24-hour	35	23.3	34.4	98	11.1	34.4	98	11.1	34.4	98
	Annual average	15	6.8	7.3	--	0.4	7.2	--	0.4	7.2	--
Nitrogen dioxide	Annual average	100	5.6	17.1	--	5.5	11.1	--	5.5	11.1	--
Carbon monoxide	1-hour	40,000	1,832	4,968	--	2,202	4,034	--	2,162	3,994	--
	8-hour	10,000	1,718	2,959	30	871	2,590	30	856	2,574	30
Lead	Rolling 3-month average	0.15	0.04	0.048	--	0.008	0.048	--	0.008	0.048	--

a/ Background concentration values are from the final column in Table 11. **µg/m³**= micrograms per cubic meter.
b/ Modeled existing conditions baseline values were calculated using Jackson Hole Airport operations from October 2004 through September 2005.
c/ Air Quality Index is only calculated for the 8-hour or 24-hour averaging periods for pollutants. All Air Quality Index values represent the highest modeled value for that averaging period at the airport boundary and were calculated using the procedures in Mintz (2009).
d/ Value represents emissions (column 7) plus background (column 4)

Effects on Health Concerns as Indicated by the Air Quality Index

Table 36 shows the modeled Air Quality Index values that would occur with the implementation of Alternative 1 in 2015 and 2025. Decreases in emissions from the airport that would result from implementing Alternative 1 would not be sufficiently large to change any of the Air Quality Index values compared to those that would occur under the modeled existing conditions baseline. There would continue to not be any health-related concerns for members of sensitive groups breathing the air at the airport boundary line, based on the combined effects of airport emissions and background concentrations of criteria pollutants. As a result, prior to 2033, there would be no discernable negative effects on human health, as indicated by the Air Quality Index from Alternative 1, since none of the Air Quality Index values would change. After 2033, all airport-related emissions would cease. This may improve air quality sufficiently to change the index values for the better, resulting in long-term, beneficial impacts.

Effects on Lead Emissions from the Use of Leaded Gasoline in Piston-Engine Aircraft

Tables 35 and 36 respectively include the analysis of emissions of lead in tons per year and micrograms per cubic meter in 2015 and 2025. Modeling showed that a reduction of about 20 pounds per year (0.01 tons) would occur between Alternative 1 and the modeled existing conditions baseline, but this difference was too small to be reflected in Table 36. No measurable difference was seen in Alternative 1 model results between 2015 and 2025.

Effects on Prevention of Significant Deterioration Increment

As described in Chapter 3, the proposed action to extend the 1983 agreement for the Jackson Hole Airport is not subject to review under Clean Air Act regulations for consumption of increment relating to Prevention of Significant Deterioration permitting. However, a similar-type analysis for consumption of increment was performed for each alternative to address comments from the U.S. Environmental Protection Agency regarding the draft environmental impact statement.

The analysis of effects on the Prevention of Significant Deterioration increment compared impacts for Alternative 1 in 2015 and 2025 to the modeled existing conditions baseline. This was accomplished by subtracting baseline model-predicted results for a given pollutant and averaging period from the alternative future year result. The results in show whether the alternative is increment-consuming (positive values) relative to the modeled existing conditions baseline or increment-expanding (negative values). Table 37 provides the increment assessment summary using the Class I standards, which were applied to the Class I parts of the evaluation area. Results for the Class II area using Class II increment standards are provided in Table 38. All of the values in the table are the maximum differences that would occur between the modeled existing conditions baseline and future conditions with the implementation of Alternative 1.

The results for Class I areas in Table 37 show that for all combinations of future years, pollutants, and averaging period, the results for Alternative 1 are well under the standard. In fact, most results are slightly negative, indicating an increment-expanding situation for impacts from future emissions relative to modeled existing conditions baseline emissions. The exception to this is for 24-hour particulate matter impacts, which indicate no discernable change from the baseline.

TABLE 37: CLASS I INCREMENT ASSESSMENT SUMMARY OF FUTURE YEAR MINUS MODELED EXISTING CONDITIONS BASELINE YEAR – MAXIMUM (MICROGRAMS PER CUBIC METER)

Pollutant and Averaging Period	Standard	Alternative 1 2015	Alternative 1 2025	Alternative 2 2015	Alternative 2 2025
Sulfur dioxide, 3-hour	25.0	-0.00283	-0.00283	-0.00283	-0.00283
Sulfur dioxide, 24-hour	5.0	-0.01871	-0.01847	-0.01195	-0.01161
Sulfur dioxide, annual	2.0	-0.00027	-0.00026	-0.00020	-0.00020
Particulate matter (10 microns or less in diameter) 24-hour	8.0	0.0	0.0	0.12759	0.11183
Particulate matter (10 microns or less in diameter) annual	4.0	-0.00003	-0.00003	0.01613	0.01426
Nitrogen dioxide, annual	2.5	-0.00294	-0.00299	-0.00074	-0.00082

TABLE 38: CLASS II INCREMENT ASSESSMENT SUMMARY OF FUTURE YEAR MINUS MODELED EXISTING CONDITIONS BASELINE YEAR – MAXIMUM (MICROGRAMS PER CUBIC METER)

Pollutant and Averaging Period	Standard	Alternative 1 2015	Alternative 1 2025	Alternative 2 2015	Alternative 2 2025
Sulfur dioxide 3-hour	512	-0.08806	-0.08745	-0.07238	-0.07165
Sulfur dioxide 24-hour	91	-0.01607	-0.01593	-0.01235	-0.01217
Sulfur dioxide annual	20	-0.00023	-0.00023	-0.00013	-0.00012
Particulate matter (10 microns or less in diameter) 24-hour	30/8	-0.00037	-0.00035	0.12513	0.10983
Particulate matter (10 microns or less in diameter) annual	17/4	-0.00002	-0.00002	0.00760	0.00674
Nitrogen dioxide annual	25	-0.00237	-0.00241	0.65559	0.59943

The results for the Class II areas are similar to those for Class I areas. All of the results are well under the standard, and all are slightly negative, indicating an increment-expanding situation for impacts from future emissions relative to modeled existing conditions baseline emissions.

The significant impact area was calculated as part of the evaluation of the Prevention of Significant Deterioration increment. As with the National Ambient Air Quality Standards compliance analysis, the significant impact area results were considered to be reasonable worst-case, in that all sources were assumed to be operating simultaneously. For both timeframes under Alternative 1, the significant impact areas for criteria pollutants would be smaller than those that would occur with the modeled existing conditions baseline (presented in Table 13).

Prior to 2033, the effects of Alternative 1 on Prevention of Significant Deterioration increment would be increment expanding (emissions would be reduced), direct, and long-term. This change would be beneficial because emissions would be reduced. However, the change would be so small that it would not be discernable from variations that occur because of climatologic variations among years. After airport closure in 2033, emissions from airport operations would end, creating a greater beneficial impact by further reducing pollutant emissions that affect the Prevention of Significant Deterioration increment.

Effects on Visibility

As described in Chapter 3, the action to extend the 1983 agreement for the Jackson Hole Airport is not subject to review under Clean Air Act regulations for protection of visibility relating to Prevention of Significant Deterioration permitting. However, a similar-type analysis for protection of visibility was performed for each alternative to address comments from the U.S. Environmental Protection Agency regarding the draft environmental impact statement.

VISCREEN model results for Alternative 1 in 2015 and 2025 are provided for color and contrast. Results are compared to the screening thresholds in Table 34 (which are duplicated in Table 39) and the impact thresholds. The conditions in 2015 and 2025 under Alternative 1 were compared to the modeled existing conditions baseline to determine relative change. Results are shown in Table 39.

TABLE 39: VISCREEN MODELING RESULTS FOR VISIBILITY USING WORST-CASE, SHORT-TERM EMISSION RATES

Screening Factor and Screening Threshold	Existing Baseline	Alternative 1 2015	Alternative 1 2025	Alternative 2 2015	Alternative 2 2025
Delta E Sky color: 2.0	1.618	1.080	1.074	1.495	1.483
Delta E Terrain color: 2.0	0.574	0.477	0.476	0.573	0.572
Sky contrast: 0.05	-0.011	-0.008	-0.008	-0.011	-0.011
Terrain contrast: 0.05	0.005	0.004	0.004	0.005	0.005

As discussed in the “Affected Environment” section, emissions resulting from existing activities at the Jackson Hole Airport are not causing changes in visibility in Grand Teton National Park that would be perceptible to untrained observers under “reasonable worst case” conditions. Because of this situation, the small improvements in visibility that would result from the implementation of Alternative 1 in both 2015 and 2025 also would not be perceptible. After 2033, all airport-related emissions would cease, which would improve overall air quality in Grand Teton National Park. However because airport operations are not expected to appreciably affect visibility prior to 2033, closure of the airport may not result in perceptible improvements in visibility after 2033.

Effects on Total Nitrogen and Sulfur Deposition in Sensitive, High-Elevation Lakes

The contribution of Jackson Hole Airport emissions to deposition levels at sensitive lakes in Grand Teton National Park were estimated using the Level I analysis approach as described in the *Interagency Work Group on Air Quality Modeling (IWAQM) Phase I Report* (U.S. Environmental Protection Agency 1993). This approach uses the model-predicted concentrations of sulfur dioxide and nitrogen oxides to estimate annual average total sulfur and nitrogen deposition rates in kilograms per hectare using a series of conversion factors and defined deposition velocities for various averaging periods. Appendix H presents deposition results in a series of tables that lists, for each identified lake for which a discrete receptor point was established, the annual average total sulfur and nitrogen deposition levels that would occur for meteorological conditions each year from 2004 through 2008.

The deposition results for Alternative 1 for 2015 and 2025 were compared to the NPS deposition analysis thresholds shown in Table 34. They also were compared to total deposition that is estimated to be occurring from all sources, and airport-related deposition that was estimated for the 2004-2005 modeled existing conditions baseline to determine relative change.

Results for Alternative 1 showed reductions in deposition rates related to airport operations compared to those that are occurring under the modeled existing conditions baseline. The deposition analysis threshold of 0.005 kilograms per hectare per year does not apply here because there is a decrease in the emissions under Alternative 1 when compared with the existing conditions baseline.

Using the data from Noname-55 Lake in 2025 shown in Appendix H, based on the 5-year maximum nitrogen deposition rate, there would be a decrease of 0.37 kilograms per hectare per year from the modeled existing conditions of nitrogen deposition (0.52 kilograms per hectare per year) related to airport operations. For sulfur, there would be a decrease of 0.047 kilograms per hectare per year when compared with the existing sulfur deposition rate of 0.072 kilograms per hectare per year related to airport operations.

The nitrogen deposition rate, including airport and non-airport sources, at Noname-55 Lake would decrease from an estimated 5.8 kilograms per hectare per year to 5.7 kilograms per hectare per year under Alternative 1 in both 2015 and 2025. This represents a reduction in the deposition rate of nitrogen by 2.6% when compared with current conditions. For sulfur, the deposition rate would change from 3.2 kilograms per hectare per year to 3.15 kilograms per hectare per year, which is a 1.6% reduction in the sulfur deposition rate. Although the deposition rate would remain above the critical load value for nitrogen under this alternative, there would be about a 2% reduction each in deposition rates of nitrogen and sulfur.

Because of this decrease in deposition rates, Alternative 1 through modeled year 2025 would have direct, long-term, beneficial impacts when compared with existing conditions, even at the worst-case site, Noname-55 Lake. However, the nitrogen deposition rate from all sources would still exceed the critical value load of 1.5 kilograms per hectare per year. as described in Chapter 3, and would continue to be of concern and may warrant potential mitigation. Mitigation measures proposed in Chapter 2 could include the conversion of airport boilers, generators, and other ground equipment to clean energy sources as well as pursuing ISO 14001 certification. These mitigation measures would reduce the deposition rates for both nitrogen and sulfur under Alternative 1, but may not reduce the rates below the critical value thresholds of 1.5 kilograms per hectare per year for high-elevation lakes and 4.0 kilograms per year for terrestrial alpine communities.

After 2033, the airport-related contribution to nitrogen and sulfur deposition would be eliminated, which would further reduce deposition. This may reduce the deposition rate for nitrogen to below the critical load value of 4.0 kilograms per hectare per year for alpine vegetation, but would not be likely to reduce the nitrogen deposition rate to below the critical load value of 1.5 kilograms per hectare per year for high-elevation lakes in Grand Teton National Park.

Effects on Climate Change

Table 40 compares the greenhouse gas emissions from aircraft operations at the Jackson Hole Airport for Alternative 1 in 2015 and 2025 with those that were modeled for the October 2004 through

September 2005 baseline. The basis for the estimates of greenhouse gas emissions in carbon dioxide equivalent is provided in Appendix H.

TABLE 40: EMISSIONS OF GREENHOUSE GASES FROM AIRCRAFT, IN CARBON DIOXIDE EQUIVALENT, MODELED FOR BASELINE OPERATIONS AND EACH ALTERNATIVE

Greenhouse Gas Emissions in Metric Tons per Year	Baseline	Alternative 1		Alternative 2	
		2015	2025	2015	2025
Carbon dioxide [a/]	26,545	11,688	12,281	26,470	27,213
Nitrous oxide [a/]	262	115	121	262	269
Methane [a/]	19	9	10	18	18
Total [a/]	26,826	11,812	12,412	26,750	27,500

a/ As carbon dioxide equivalent. A metric ton equals to 1,000 kilograms or 2,205 pounds.

The model results indicate that total carbon dioxide emissions from aircraft operations would be reduced by more than half by the elimination of scheduled passenger aircraft operations. After the airport closed in 2033, emissions from greenhouse gas emissions from aircraft operations at the Jackson Hole Airport would be eliminated.

Alternative 1 would result in a small reduction of emissions of greenhouse gases in the Jackson area. Based on estimated 2008 county-wide emissions of about 372,000 metric tons carbon dioxide equivalent (Heede 2009), this would cause a 3% decrease in emissions in the county in 2025, and a 7% drop after the airport closed in 2033. The proportional decrease locally could be even greater if initiatives such as the Jackson Hole Energy Sustainability Project were effective in reducing greenhouse gas emissions from other sources in the county. These changes related to reduced airport operations probably would be detectable on a county-wide basis.

Cumulative Impacts

Under Alternative 1, the airport would continue to operate until the end of the term of the existing agreement in 2033. However, after 2015, the airport would likely lose its Part 139 certification and scheduled passenger aircraft operations would cease. This would reduce aircraft operations by about 25% until 2033 when the airport would close. (General aviation aircraft operations, which account for 75% of all current operations, would continue until airport closure.)

Prior to 2033, airport emissions would continue to contribute to the emissions profile for the park that adversely affect air quality. While the parameters modeled under this alternative show a modest decrease in emissions, the long-term, cumulative consequences of continued airport operations across all modeled parameters would be adverse because of the added contribution of airport emissions to emissions from other sources.

This is most important when considering cumulative impacts to high-elevation lakes and terrestrial alpine communities in the park. As described in Chapter 3, the existing deposition rates from all airport and non-airport sources are estimated at 5.8 kilograms per hectare per year for nitrogen and 3.2 kilograms per hectare per year for sulfur. Because these values already exceed the critical load values for high-elevation lakes and terrestrial alpine communities in Grand Teton National Park, it is likely that adverse changes to high-elevation lakes, and possibly to terrestrial communities, are already occurring. Therefore, operation of the airport until 2033 would continue to contribute to the exceedence of the critical load values and would perpetuate adverse conditions. While the worst-site contribution of the airport to the deposition rate (modeled to be at Noname-55 Lake) is estimated at 8%, and other, non-airport sources contribute 92% or more to the deposition rate, the cumulative impact of airport emissions on high-elevation lakes and terrestrial alpine communities would continue to be adverse until 2033.

After 2033, all airport-related emissions would cease, resulting in a beneficial, long-term, cumulative effect on air quality in and near Grand Teton National Park. There would still be emissions related to other sources, both locally and regionally, but the reduction in airport-related emissions would improve air quality conditions across all modeled parameters. However, for nitrogen and sulfur deposition, elimination of airport-related sources probably would not reduce the overall deposition level below the critical load value for high-elevation lakes in the park.

In a cumulative impacts context, some air emissions concerns would be transferred to the vicinity of other airports that received additional aviation traffic that was displaced from the Jackson Hole Airport. This would help the National Park Service achieve or maintain Class I standards in the park by transferring emissions to Class II areas, but would not alter larger-scale air quality concerns. For example, because the effects of greenhouse gases are global rather than local, the cumulative impact of Alternative 1 on climate change would be negligible.

Conclusions

Table 41 summarizes impacts of Alternative 1 on air quality relative to the modeled existing conditions baseline that was presented in Chapter 3. The table identifies whether the impact would be beneficial or adverse relative to the baseline. All of the impacts would be direct and long-term.

Table 41 also includes a brief description of the modeled existing conditions baseline. The baseline for each parameter is expressed in either a modeled value or in terms of whether it meets the corresponding air quality standard or screening threshold, or exceeds a critical load value. These descriptions are relevant to the Alternative 1 analysis only to the extent that they provide a basis of comparison for this complex, multi-faceted air quality analysis.

Alternative 1 in 2015 and 2025 would reduce the emissions of air pollutants from the Jackson Hole Airport relative to emissions in the modeled existing conditions baseline, which would have a long-term, direct, beneficial, impact on air quality. However, the overall nitrogen deposition rate from all sources would still exceed the critical value load of 1.5 kilograms per hectare per year as described in Chapter 3, and would continue to be of concern and may warrant potential mitigation as detailed above. After 2033, closure of the airport would eliminate airport-related emissions and, thus, reduce the emissions profile of the park. This would have a direct, long-term, beneficial impact on air quality in Grand Teton National Park.

Prior to 2033, cumulative impacts under Alternative 1 would be adverse and long-term for all modeled parameters because of the continued contribution of airport emissions. After 2033, impacts would change to negligible or beneficial.

TABLE 41: SUMMARY OF CONCLUSIONS REGARDING DIRECT IMPACTS OF ALTERNATIVE 1 ON AIR QUALITY COMPARED TO MODELED EXISTING CONDITIONS BASELINE

Factor	Modeled Existing Conditions Baseline	Alternative 1 2015	Alternative 1 2025
Effects on emissions of criteria pollutants			
Sulfur dioxide	23.3 tons per year	Beneficial (-16.8) [a/]	Beneficial (-16.6) [a/]
Particulate matter (10 microns or less in diameter)	3.7 tons per year	Beneficial (-0.9) [a/]	Beneficial (-0.9) [a/]
Nitrogen oxides	137.3 tons per year	Beneficial (-87.2) [a/]	Beneficial (-88.6) [a/]
Carbon monoxide	549.8 tons per year	Beneficial (-164.9) [a/]	Beneficial (-172.2) [a/]
Lead	0.05 tons per year	Beneficial (-0.01) [a/]	Beneficial (-0.01) [a/]
Effects on ability to meet National Ambient Air Quality Standards (all averaging periods)			
Sulfur dioxide	Below standards	Remains below standards	Remains below standards
Particulate matter (10 microns or less in diameter)	Below standards	Remains below standards	Remains below standards
Particulate matter (2.5 microns or less in diameter)	Below standards	Remains below standards	Remains below standards
Nitrogen oxides	Below standards	Remains below standards	Remains below standards
Carbon monoxide	Below standards	Remains below standards	Remains below standards
Lead	Below standards	Remains below standards	Remains below standards
Effects on health concerns as indicated by the Air Quality Index score			
Sulfur dioxide	29	No change in score	No change in score
Particulate matter (10 microns or less in diameter)	75	No change in score	No change in score
Particulate matter (2.5 microns or less in diameter)	98	No change in score	No change in score
Carbon monoxide	30	No change in score	No change in score
Effects on lead emissions from the use of leaded gasoline in piston-engine aircraft	Below standards	Beneficial (-0.1) [a/] Remains below standards	Beneficial (-0.1) [a/] Remains below standards
Effects on Class I Prevention of Significant Deterioration increment within the significant impact (SIL) radius			
Sulfur dioxide, 3-hour and 24-hour	SIL radius > 14 kilometers (8.7 miles)	Beneficial, expands available increment	Beneficial, expands available increment
Sulfur dioxide, annual	SIL radius = 4.6 kilometers (2.9 miles)	Beneficial, expands available increment	Beneficial, expands available increment
Particulate matter (10 microns or less in diameter) 24-hour	SIL radius = 8.5 kilometers (5.0 miles)	No effect on available increment	No effect on available increment
Particulate matter (10 microns or less in diameter) annual	SIL radius = 0.9 kilometers (0.6 miles)	Beneficial, expands available increment	Beneficial, expands available increment
Nitrogen dioxide annual	SIL radius = 10.7 kilometers (6.6 miles)	Beneficial, expands available increment	Beneficial, expands available increment

TABLE 41: SUMMARY OF CONCLUSIONS REGARDING DIRECT IMPACTS OF ALTERNATIVE 1 ON AIR QUALITY COMPARED TO MODELED EXISTING CONDITIONS BASELINE (CONTINUED)

Factor	Modeled Existing Conditions Baseline	Alternative 1 2015	Alternative 1 2025
Effects on Class II Prevention of Significant Deterioration increment			
Sulfur dioxide, all averaging periods	Noncontrolling: smaller than Class I SIL	Beneficial, expands available increment	Beneficial, expands available increment
Particulate matter (10 microns or less in diameter) 24-hour	Noncontrolling: smaller than Class I SIL	Beneficial, expands available increment	Beneficial, expands available increment
Particulate matter (10 microns or less in diameter) annual	Noncontrolling: smaller than Class I SIL	Beneficial, expands available increment	Beneficial, expands available increment
Nitrogen dioxide annual	Noncontrolling: smaller than Class I SIL	Beneficial, expands available increment	Beneficial, expands available increment
Effects on visibility	Below screening criteria	Beneficial, remains below screening criteria	Beneficial, remains below screening criteria
Effects on deposition in sensitive, high-elevation lakes			
Total nitrogen deposition	5.8 kilograms per hectare per year Exceeds the CLV [b/]	Beneficial (-0.1) [c/]	Beneficial (-0.1) [c/]
Total sulfur deposition	3.2 kilograms per hectare per year Exceeds the CLV [b/]	Beneficial (-0.05) [c/]	Beneficial (-0.05) [c/]
Effects on climate change	26,826 metric tons per year in carbon dioxide equivalent	Beneficial (-15,014) [d/]	Beneficial (-14,414) [d/]

a/ Values are in tons per year. Values in parentheses are differences in emissions of criteria pollutants from the modeled existing conditions baseline, which reflects actual airport operations from October 2004 through September 2005.

b/ The critical load value (CLV) for high-elevation lakes estimated for Grand Teton National Park is 1.5 kilograms per hectare per year and the critical load value for terrestrial alpine communities is estimated at 4.0 kilograms per hectare per year.

c/ Values in parentheses are differences from modeled, airport-related deposition rates for nitrogen and sulfur when compared to the existing conditions baseline. The values decrease from existing conditions but still remain above the critical load value and may warrant mitigation as proposed in Chapter 2.

d/ Values are in metric tons per year carbon dioxide equivalent. Values in parentheses are differences in emissions of greenhouse gases from the modeled existing conditions baseline, which reflects actual airport operations from October 2004 through September 2005.

VISUAL QUALITY AND DARK SKIES

Regulations and Policies

Protecting the visual quality of the national parks' scenery and providing for the enjoyment of that scenery is the first-mentioned charge of Congress to the National Park Service in the Organic Act. Specifically, 16 *United States Code*, Chapter 1 (with ***bolding*** added) states that:

> *[The National Park Service] shall promote and regulate the use of the Federal areas known as national parks [to] conform to the fundamental purpose of the said parks, which purpose is to* ***conserve the scenery*** *and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.*

The National Park Service considers the experience of a naturally dark night or a pristine, starry night sky as important elements of the "scenery" within national park units that the Organic Act directs should be conserved (NPS 2003).

Based on the Organic Act, section 1.4.6 of *Management Policies 2006* (NPS 2006a) identifies park resources and values that are subject to the no-impairment standard of the Organic Act and the General Authorities Act. As shown below (with ***bolding*** added), scenery and other visual resources are again listed first, demonstrating their importance in the purpose of the national parks and the NPS' mission:

> *The "park resources and values" that are subject to the no-impairment standard include the park's* ***scenery****, natural and historic objects, and wildlife, and the processes and conditions that sustain them, including, to the extent present in the park: the ecological, biological, and physical processes that created the park and continue to act upon it;* ***scenic features; natural visibility, both in daytime and at night; natural landscapes;*** *natural soundscapes and smells; water and air resources; soils; geological resources; paleontological resources; archeological resources; cultural landscapes; ethnographic resources; historic and prehistoric sites, structures, and objects; museum collections; and native plants and animals.*

Current laws and NPS policies identify the following desired conditions in Grand Teton National Park with regard to visual quality and dark skies relative to the presence and operation of the Jackson Hole Airport.

Desired Condition	Source
The National Park Service understands, maintains, restores, and protects the inherent integrity of highly valued scenic views. This includes the condition of views that would occur in the absence of human dominance over the landscape. On sites from which previous development is being removed, landscape conditions altered by human activity are restored to a natural condition by removing constructed features and revegetating with native park species.	Organic Act *Management Policies 2006* (NPS 2006a)
Facilities are integrated into the park landscape and environs with sustainable designs and systems to minimize environmental impact. Development does not compete with or dominate park features.	*Management Policies 2006* (NPS 2006a)
When installations such as landing sites and airstrips are necessary, they are located and designed to minimize their impact on resources and their intrusion on the visitor experience.	*Management Policies 2006* (NPS 2006a)
The natural darkness of the park is preserved. The National Park Service cooperates with park visitors, neighbors, and local government agencies to prevent or minimize the intrusion of artificial light into the night scene.	Organic Act *Management Policies 2006* (NPS 2006a)
Use of artificial lighting is restricted to those areas where security, basic human safety, and specific cultural resource requirements must be met.	*Management Policies 2006* (NPS 2006a)
Minimal impact lighting techniques are used. Artificial lighting is shielded to prevent the disruption of the night sky.	*Management Policies 2006* (NPS 2006a)

Methods

Impacts on visual quality and dark skies were evaluated using the process described in the "Methods for Analyzing Impacts" section at the beginning of Chapter 4. Multiple techniques are available to analyze impacts on visual quality and dark skies, including the methods described below that were used in this environmental impact statement. These methods were employed in part because it they are readily understood by everyone from professionals to the general public:

- The U.S. Forest Service scenic integrity levels that were described in the "Affected Environment" section under "Measuring Visual Quality" were adapted for use as visual quality thresholds.
- The light-polluted sky levels that were developed by the International Dark-Sky Association (1997) and described in the "Affected Environment" section under "Measuring Light Pollution" were adapted for use as dark sky impact thresholds.

Impacts were indicated by changes between levels. For example, a change in the scenic integrity from moderate to high would be considered a one-step change. A change in the visibility of the night sky from a magnitude +5.0 sky to a magnitude +3.0 sky would be a two-step change. Impact threshold definitions for visual quality and dark skies are as follows.

Negligible: Visual quality and natural lightscapes (dark skies) would not be affected, or effects would not be perceptible or measurable (a no-step change in scenic integrity or a no-step change in the observable magnitude of the night sky).

Minor: Observers who were familiar with the scene from a specified viewpoint would note a one-step change in scenic integrity of foreground and/or midground views. For example, the scenic integrity in these views would change from high to very high on the measurement scale provided previously under the heading "Measuring Visual Quality." The change would be based on descriptors such as contrast of color, form, line and texture with the natural landscape; tendency to draw the eye from the scenery; consistency with the character of the area; and/or obstruction of views. No change in the scenic integrity of background views would be perceived by these observers.

Effects on natural lightscapes (dark skies) would be perceived in the immediate vicinity of project-related artificial light sources and would result in a one-step change in the observable magnitude of the night sky. For example, visibility would change from a magnitude +5.0 sky to a magnitude +6.0 sky on the measurement scale provided previously under the heading "Measuring Light Pollution." Outside the immediate vicinity of project-related artificial light sources, the change in the observable magnitude of the night sky that could be perceived by trained observers would be less than one step.

Moderate: Observers who were familiar with the scene from a specified viewpoint would note a two-step change in scenic integrity of foreground or midground views. For background views, a one-step change in the scenic integrity of landscapes would be noted by these observers. Many visitors would be able to express an opinion regarding the difference and for some, the quality of the viewing experience would be altered.

Effects on natural lightscapes (dark skies) would be readily apparent in the immediate vicinity of project-related artificial light sources and would result in a two-step or greater change in the observable magnitude of the night sky. Outside the immediate vicinity of project-related artificial light sources, a one-step change in the observable magnitude of the night sky could be perceived by trained observers. However, regional effects on dark skies would not occur.

Major: Observers who were familiar with the scene from a specified viewpoint would note a three-step or greater change in scenic integrity of midground views. For background views, a two-step or greater change in the scenic integrity of landscapes would be noted by these observers. The satisfaction of many members of the public with the viewing experience would be substantially altered.

Effects on natural lightscapes (dark skies) would be readily apparent outside the immediate vicinity of project-related artificial light sources, and a two-step or greater change in the observable magnitude of the night sky would be observed. Regionally, trained observers would note a one-step or greater change in the apparent magnitude of the night sky.

Short-term: Effects would occur only during and shortly after a specified action or treatment.

Long-term: Effects would persist well beyond the duration of a specified action or treatment, or would not be associated with an particular activity such as construction.

The geographic area considered for visual quality and dark skies is bounded on the east by U.S. Highway 26/89/191, on the west by the Teton Range crest, on the north by Moose, and on the south by Jackson.

Three issues relating to visual quality and dark skies were identified during scoping. They include:

- Effects on the visibility of airport facilities from locations within the park.
- Effects on the scenery of the Grand Teton National Park experience, including the visibility of broad or distant vistas.
- Effects on the levels of light emissions at night and the visibility of dark skies.

Analysis

Effects on the Visibility of Airport Facilities

During the transition and general aviation periods, the effects of Alternative 1 on the visibility of existing airport facilities would be negligible. Prior to 2033, the Jackson Hole Airport Board could make changes within the development subzone, such as replacing existing buildings with new buildings and/or increasing the number of buildings to support changes in general aviation activities. However, all development would continue to be restricted to the development subzone, and the current height restrictions and color scheme would be maintained. As a result, the visibility of airport structures would not change, and the existing scenic integrity levels would be maintained.

Trees have been planted along the east boundary of the airport to provide some visual screening from viewpoints along U.S. Highway 26/89/191 and the airport road. The continued growth of these trees, and any supplemental plantings, may further reduce the visibility of airport structures. However, the midground view of the landscape from U.S. Highway 26/89/191 would continue to appear slightly altered, and the moderate scenic integrity of the landscape would not change.

Following closure of the Jackson Hole Airport in 2033, all of the airport facilities would be removed and the airport site would be returned to a natural condition. The interagency helibase also would be removed, and a new facility would be established on or near already-developed land in the region (but not necessarily within Grand Teton National Park). Following restoration of the airport, helibase, and airport road sites:

- Foreground views would, in time, be restored to high scenic integrity. This would be a long-term, beneficial, direct effect of moderate intensity.
- Because the housing development to the south and west outside the park would continue to represent deviations from the intact natural condition, effects on midground views would be similar to those described above, with a long-term, beneficial, direct effect of minor intensity.
- Background views of the Teton Range would not be altered and effects on the scenic integrity levels of background views would be negligible.

Effects on the Scenery and the Visibility of Broad or Distant Vistas

As described above, the facilities associated with the Jackson Hole Airport affect scenic integrity only in foreground and midground views. Therefore, effects of Alternative 1 on the scenery of the park, including the visibility of broad or distant vistas, would only be indirect. These effects would result from changes in the visibility of flying aircraft, and their tendency to draw the viewer's attention away from the scenery to the aircraft itself and to the airport in the midground view.

Scheduled passenger service at the Jackson Hole Airport would decrease during the Alternative 1 transition period and would end in 2015 at the beginning of the general aviation period. At that time, the current schedule of about 30 daily scheduled passenger operations at the airport, some of which use large jets such as the Airbus A319 and Boeing 737, would cease. The absence of their relatively low-level flights on final approach or takeoff just north of the airport would decrease the number of events in which aircraft movement would draw the viewer's attention away from the scenery.

In recent years, there has been an increase in the number of large, privately owned jets that use the Jackson Hole Airport. This trend could continue throughout the general aviation period. However, it is unlikely that, by 2033, there would be 30 daily operations by private jets in the size class of the Airbus A319 and Boeing 737. Therefore, compared to current conditions, there would be a reduction in the number of the largest, and therefore most visible, aircraft using the airport.

Barring an event that would render the runway unusable, general aviation use of the Jackson Hole Airport probably would increase between 2015 and 2033. Most of the increase is expected in smaller aircraft, such as microjets and traditional piston-driven aircraft. Because of their small size, these aircraft are not as visible against the landscape, and there is less tendency for their movement to catch the eye of the typical park visitor and divert it from the scenery.

Effects on the scenery of Grand Teton National Park primarily would occur from viewpoints along U.S. Highway 26/89/191 between the Teton Point Turnout and airport road intersection. (Viewpoints along the airport road were not considered, because this road primarily is used for travel to the airport rather than scenery viewing. Viewpoints along the Teton Park Road were not considered because most aircraft fly east of this road, rather than between the road and the Teton Range peaks.) Based on the changes in aircraft numbers and sizes discussed above, Alternative 1 prior to 2033 would have an indirect, long-term, beneficial effect of negligible to minor intensity when compared to current conditions.

Closure of the airport in 2033 would eliminate all aircraft movement between observers on U.S. Highway 26/89/191 and the Teton Range about 10 miles to the west. The result would be an indirect, long-term, beneficial effect on the scenery. The intensity would be minor, based on the low level of disturbance of broad or distant vistas that occurred previously because of flying aircraft.

Effects on Light Emissions and the Visibility of Dark Skies

Throughout the transition and general aviation periods, there would be little change in light emissions from the Jackson Hole Airport or in the visibility of dark skies. Navigational lighting and exterior lighting might be upgraded, but practices currently in place to limit their effects on the visibility of night skies would continue to minimize impacts. Improvements in reducing fugitive light emissions would be made whenever light fixtures were replaced or upgraded, but the difference would not change the visibility of the night sky in lighted areas, or markedly improve the visibility outside of the lighted areas. As a result, the effects on the visibility of dark skies would be negligible.

Light emissions from automobile headlights along the airport road and U.S. Highway 26/89/191 between the airport and Jackson would be reduced, particularly during the winter. However, many of the passengers who formerly flew into the Jackson Hole Airport on scheduled airline service probably would access the area through another airport. As a result, the location of headlight use might change, but the net effect on dark skies would be indirect and negligible.

In 2033, the Jackson Hole Airport would be closed and all lighting associated with the airport would be removed. As a result, Alternative 1 would have the following effects.

- The visibility of the night sky in and near the previously lighted areas of the former development subzone would change from current magnitudes of +3.0 to +5.0 to about magnitude +6.0. Light from the housing development adjacent to the park boundary would prevent this area from achieving the extremely high-quality dark-sky conditions that prevail farther north in Grand Teton National Park. The effect in this area on dark skies would be long-term, indirect, beneficial, and of moderate intensity.
- There would be a limited effect in the south part of the former airport, which would continue to be adversely affected by light pollution from the housing development outside the park boundary. The long-term, indirect, beneficial effect in this area would be of negligible to minor intensity.
- The visibility of dark skies throughout the northern half of the former airport area would improve from current ratings of magnitude +5.5 or +6.0 to ratings approaching the magnitude +6.7 skies that are common throughout the undeveloped areas of the park. The effect in this area on dark skies would be long-term, indirect, beneficial, and of minor to moderate intensity.

Regional changes in the visibility of dark skies as a result of the closure and removal of the Jackson Hole Airport after 2033 would be negligible.

Cumulative Impacts

Visual Quality

Residential and, possibly, commercial development is expected to continue on the private land between the park boundary and the Snake River that is visible from U.S. Highway 26/89/191. The Jackson area has a strong market for primary and second homes and the commercial services that support them. Residential development already has occurred outside the park boundary west and southwest of the airport, and additional construction is expected in this area between now and 2033. Because of the distance from observation points along the highway to the park boundary, this development would occur in midground views.

- Additional development located in views that currently have low to very low scenic integrity would have a long-term, adverse effect of negligible intensity on visual quality.
- Development in views that currently have moderate scenic integrity would have a long-term, adverse effect of minor intensity.

None of these changes would be affected by changes in visual quality that would be associated with the general aviation or post-closure periods of Alternative 1. Cumulative impacts would not occur on views in other directions from observation points along U.S. Highway 26/89/191 because developable private land is beyond the range of visibility.

Alternative 1 would result in the diversion of scheduled passenger service traffic to other airports in the region. Most of this traffic probably would use the Idaho Falls Regional Airport, about 90 miles from Jackson. To handle the number of additional enplanements that currently are occurring at the Jackson Hole Airport, facility improvements would be required to approximately triple the passenger capacity of the Idaho Falls airport. These changes would result in perceived increases in the visibility of Idaho Falls airport facilities, and may decrease the scenic integrity and visibility of broad or distant vistas. However, scenic integrity of the area already has been substantially altered by existing airport facilities, other structures associated with Idaho Falls, and surrounding land uses, such as agriculture. As a result, the long-term, adverse impacts on visual quality at this alternate airport site would be of negligible or minor intensity.

Dark Skies

In the Jackson area, recreation facilities would continue to be important sources of fugitive light emissions, particularly during the evening. Almost all of these are seasonal, and include baseball diamonds and soccer fields in the spring and summer, the football field in the autumn, and the Snow King Resort in the winter (Grubb 2006). Lights at these facilities are turned down or turned off after the evening's events have ended; for example, skiing under lights at the Snow King Resort ends at 8:00 P.M. and the lights are turned off after the slopes have been cleared of skiers.

Future development in Jackson and Teton County would add additional sources of outdoor lighting. Although all of these sources would have to meet town or county requirements for controlling fugitive light, they collectively would increase the overall level of light emissions. However, some of this would be offset as existing light sources, particularly at recreation facilities and smaller commercial sites, are upgraded over time to meet town and county fugitive light emissions control standards.

Beneficial changes in lighting in the airport area that would result from Alternative 1 would have a negligible effect on the cumulative changes in visibility of dark skies that will occur in Jackson or areas of Teton County outside the immediate vicinity of the airport.

At an alternate airport site, such as the Idaho Falls Regional Airport, additional lighting would be required for the new facilities, such as parking, that would be needed to handle the approximately three-fold increase in passenger traffic. However, the impact would be limited because all new lighting would have to meet the standards in the current edition of the Illuminating Engineering Society of North America's *IESNA Lighting Handbook*. Moreover, the Idaho Falls Regional Airport is near an urban area where extensive fugitive light emissions already have reduced the visibility of dark skies. As a result, the long-term, adverse impacts on dark skies at the alternate airport would be of negligible or minor intensity.

Conclusions

During the transition and general aviation periods, Alternative 1 would have a negligible effect on the visibility of airport facilities and on scenic integrity levels. Following closure of the airport in 2033, there would be long-term, beneficial, direct effects of minor or moderate intensity in foreground views from within the former development subzone and minor intensity in midground views looking west from observation points along U.S. Highway 26/89/191. Effects on the scenic integrity levels of other views, including background views of the Teton Range, would be negligible.

The indirect, long-term, beneficial effect on the scenery and the visibility of broad or distant vistas from observation points along U.S. Highway 26/89/191 because of the presence of aircraft in flight would be negligible during the transition and general aviation periods, and minor after 2033 when the airport was closed.

During the transition and general aviation periods, the effects of Alternative 1 on the visibility of dark skies would be negligible. Long-term, indirect, beneficial effects would occur following the closure of the airport in 2033. The intensity of the change would be negligible to minor in the south part of the airport, minor to moderate in the northern part of the airport, and moderate in the former development subzone area. Changes in the visibility of dark skies in the remainder of the park as a result of the closure and removal of the Jackson Hole Airport after 2033 would be negligible.

Alternative 1 would have negligible effects on the cumulative changes in visual quality and the visibility of dark skies that will occur in Jackson, areas of Teton County outside the immediate vicinity of the airport, or areas around the Idaho Falls Regional Airport.

There would be no impairment of visual quality or dark skies as a result of implementing Alternative 1. Effects would not be perceptible or measurable (a no-step change in scenic integrity or a no-step change in the observable magnitude of the night sky) and, thus, would not reach a level of impairment.

WATER QUALITY AND HYDROLOGY

Regulations and Policies

Current laws and NPS policies indicate the following desired conditions in Grand Teton National Park for water quality and hydrology relative to the presence and operation of the airport.

Desired Condition	Source
The surface and ground water resources of Grand Teton National Park are managed in a manner that will leave them unimpaired for the enjoyment of future generations.	Organic Act *Management Policies 2006* (NPS 2006a)
Surface and ground water resources are maintained or restored such that water quality as a minimum meets all applicable Wyoming water quality standards. The National Park Service works with appropriate governmental bodies to obtain the highest possible standards available under the Clean Water Act for the protection of park waters.	Clean Water Act Executive Order 12088 *Management Policies 2006* (NPS 2006a) Wyoming Water Quality Rules and Regulations

Desired Condition	Source
The Jackson Hole Airport is maintained and operated to avoid pollution of surface and ground water. Wastewater is adequately treated so that on its return to natural water systems, it meets or exceeds applicable state and federal water quality standards.	Clean Water Act Executive Order 12088 *Management Policies 2006* (NPS 2006a) Wyoming Water Quality Rules and Regulations
Water and wastewater systems are as unobtrusive as possible and have the least possible resource impact. Water is used efficiently and sustainably. Water systems are designed to maximally conserve water and the energy used in its distribution. Water efficient devices are installed in any remodeled or new structures.	*Management Policies 2006* (NPS 2006a)
The National Park Service and Jackson Hole Airport Board maintain up-to-date hazardous materials management plans and associated equipment and training to prevent releases of hazardous materials and to provide prompt, appropriate response to incidents that could pollute surface or ground water resources. All necessary actions are taken to control or minimize such releases when they occur.	*Management Policies 2006* (NPS 2006a)
Waste reduction, reuse, and recycling programs minimize the generation and disposal of hazardous waste. Waste management at the airport demonstrates environmental leadership and serves as a model for others to follow in managing wastes and contaminants.	*Management Policies 2006* (NPS 2006a)

Methods

Impacts on water quality and hydrology were evaluated using the process described in the "Methods for Analyzing Impacts" section. Impact threshold definitions for water quality and hydrology are as follows.

Negligible: Impacts would not be measurable. Water quality parameters would be well within all water quality standards for the designated use. Quality and flows would be within historical normal variability conditions.

Minor: Measurable changes from historical norms would occur, but quality and flows would be within the range of historical variability. All water quality parameters would be within water quality standards for the designated use. State water quality antidegradation policy would not be violated.

Moderate: Water quality or flows would be outside the range of normal variability. However, while changes to water quality or flows would be readily apparent, water quality parameters would be within water quality standards for the designated use. Mitigation would probably be necessary to offset adverse effects and would likely be successful. State water quality antidegradation policy would not be violated.

Major: Changes to water quality or flows would be readily apparent and, in the case of adverse effects, some water quality parameters for the designated use periodically would be equaled or exceeded. Flows would be outside the range of normal variability, and could include complete dewatering or unusual flooding. Extensive mitigation would be needed to offset adverse effects, and its success would not be assured. State water quality antidegradation policy may be violated.

Short-term: Effects would primarily exist during active implementation of a management action, such as construction. Effects would cease within a year following implementation of the action.

Long-term: Effects would extend more than a year beyond implementation of a management action.

The geographic area considered for impacts on water quality and hydrology primarily included the area within the airport boundary. Effects on the Snake and Gros Ventre Rivers, 1.5 and 2 miles distant, also were considered.

Two issues relating to water quality and hydrology were identified during scoping. They included:

- Effects on surface or ground water as a result of activities such as discharges from
  - National Pollutant Discharge Elimination System-permitted outfalls, including wastewater and oil/water separator discharges;
  - Fuel spills and/or leaks;
  - Glycol deicer storage, use, and disposal;
  - Aircraft and rental car maintenance operations; and
  - Ramp drainage to the Enterprise Canal.
- Cumulative water quality and hydrology effects from the airport in conjunction with all other projects on public and private lands in the vicinity.

Analysis

Surface Water

Activities at the Jackson Hole Airport currently do not adversely affect area surface water quality or hydrology. The long distances to water bodies (1.5 miles to the Snake River and 2 miles to the Gros Ventre River), the flat topography, the absence of direct surface water discharge from the airport to any surface water feature, and the highly permeable soils prevent runoff from the airport site from reaching these streams. During the general aviation period, these conditions would not change.

Except for navigational aids, all development would continue to be restricted to the airport's development subzone. Most of this area is already is covered by pavement or highly compacted soil. While the development subzone might be reconfigured to, for example, eliminate the parking that formerly was used by scheduled commercial service passengers and increase parking for general aviation aircraft, there would not be changes in the area of impervious surface. The effects of the general aviation period on surface area hydrology would be negligible.

After 2033, localized changes in surface water runoff volumes would occur when the runway, taxiway, ramp, and other impermeable surfaces were removed. However, the effects would be negligible because:

- Under pre-2033 conditions, surface water runoff from these facilities rapidly infiltrated into the soil after leaving the impermeable surfaces and did not cause problems such soil erosion or gullying;
- There would not be any changes in runoff volumes throughout the airport area, and localized changes would not be measurable; and

- There would not be any detectable changes in surface water quality, and all parameters would remain within the Class 1 (Snake River) or Class 2AB (Gros Ventre River) water quality standards.

National Pollutant Discharge Elimination System-Permitted Outfalls

Site-wide changes in water volumes associated with permitted outfalls would not occur under Alternative 1. All of the water that currently is discharged in accordance with the airport's two National Pollutant Discharge Elimination System permits originates as onsite precipitation. While the volumes flowing through the discharge points could change during the general aviation period and following airport closures, there would not be any changes in surface or ground water volumes across the airport site.

During the general aviation period, the volumes of wastewater requiring treatment in septic tank systems with subsequent discharge through permitted leach fields would decrease substantially. The elimination of scheduled passenger service would eliminate the toilet flushing and other water use by 6,000 to 40,000 people per day, or more than a quarter million people per year. Domestic sewage production by terminal employees and the restaurant also would be reduced. People using the airport for general aviation would likely produce a small fraction of the wastewater that would be eliminated by the absence of scheduled passenger operations.

Wastewater associated with the permitted outfall for the car wash at the car rental facility would decrease. Most rental cars are used by scheduled commercial aviation passengers, and the demand for rentals from this group, with an associated need for car washing, would be eliminated.

The effect on ground water quality from reduced discharges of domestic sewage and wash water would be negligible. As demonstrated by current testing, concentrations of heavy metals, volatile organic compounds, and semi-volatile organic compounds in wastewater discharges are below detectable levels. Therefore, reducing the wastewater discharges would not produce measurable effects or change the ability to meet water quality standards.

Following closure of the airport in 2033, most discharges of treated sewage and wastewater at the airport would cease. However, the effect on water quality would be negligible because there would not be any measurable changes in concentrations of contaminants that were entering the ground water system.

During the general aviation period, discharges from the permitted storm water discharge point would not change from current conditions. Best management practices for fuels, oils and greases, and solvents, and the routing of all ramp drainage through regularly maintained oil/water separators would continue to ensure that discharges did not contain pollutants that could adversely affect ground water quality.

Storm water discharge would be eliminated following airport closure in 2033. The impact would be negligible because pollutants would not have been entering the water system through this discharge point.

Fuel Spills and/or Leaks

The airport's modern, well-maintained fuel storage systems and the ongoing implementation of measures specified in the airport's spill prevention, control, and countermeasure plan have been effective in preventing contamination of area water resources by fuel spills and leaks. These features would continue to protect water quality throughout the general aviation period. As a result, changes in water quality at the airport because of fuel spills or leaks would be negligible.

Fuel spills or leaks would be eliminated as a potential source of contamination following airport closure in 2033. However, because no contamination of water resources from fuel spills or leaks would have occurred during airport operations, the effects on water quality of eliminating these potential sources would be negligible.

Glycol Deicer Storage, Use, and Disposal

Most use of propylene glycol deicer at the Jackson Hole Airport is associated with scheduled passenger service aviation and cargo carriers such as Federal Express. General aviation typically has more discretion in scheduling, and many pilots and/or their passengers may elect to stay in the Jackson area for an extra day or two rather than taking off during inclement weather that requires deicing. As a result, the storage and use of propylene glycol deicer at the Jackson Hole Airport probably would drop substantially during the general aviation period.

There is no evidence that current levels of deicer use are causing environmental problems or resulting in any contamination of water resources. Therefore, the reduced use of propylene glycol deicer during the general aviation period would not cause measurable impacts or changes in the ability to meet water quality standards, and would have a negligible effect on water quality.

Airport closure in 2033 would eliminate propylene glycol deicer as a potential source of water contamination. However, because no adverse effects on water resources from the use of this deicer would have occurred during airport operations, the effects on water quality would be negligible.

Aircraft and Rental Car Maintenance Operations

During the general aviation period, aircraft maintenance at the Jackson Hole Airport could increase, if the number of general aviation operations grew over time. Throughout this period, it is expected that the fixed-base operator would maintain its record of controlling the use and disposal of oils, greases, and solvents, and ensuring that these materials did not enter the ground water from spills, leaks, or illicit dumping. Because effective control would be maintained, the effect on water quality would be negligible.

There would be less demand for car rentals with the end of scheduled passenger service, and a corresponding decrease in oil changes performed at the airport. However, rental agencies that remained onsite would continue using measures to collect and recycle all used engine oil. Because effective control of used oil would be maintained, the effect of its decreased use would be negligible.

Airport closure in 2033 would eliminate oils, greases, and solvents as potential sources of water pollution. Because adverse effects on water resources did not occur from the use of these materials throughout the life if their airport, the effects on water quality of eliminating their use at the site would be negligible.

Ramp Drainage Discharges to the Enterprise Canal

The Enterprise Canal would continue to be unaffected by operations at the Jackson Hole Airport. Routing of treated water from the ramp under the canal would continue throughout the general aviation period, and the effects of this alternative on the canal would be negligible. Similarly, negligible changes in canal flows or water quality would result from airport closure in 2033.

Cumulative Impacts

Alternative 1 would have a negligible effect on area-wide changes in hydrology. As described above, all water used at the airport would continue to originate onsite as precipitation or well water. Both during the general aviation period and following airport closure, all of that water would continue to infiltrate back into the soils and underlying hydrologic system before leaving the airport site.

Alternative 1 also would have a negligible cumulative effect on area-wide water quality. During the general aviation period, best management practices would continue to be implemented to ensure that contaminants did not enter the water system. Following airport closure, the airport would be eliminated as a potential source of contamination of area waters.

Alternative 1 would result in the diversion of scheduled passenger service traffic to other airports in the region. Most of this traffic probably would use the Idaho Falls Regional Airport, about 90 miles from Jackson. Because this airport has enacted the same types of stringent water protection measures that are employed at the Jackson Hole Airport, it would be able to handle a major increase in aircraft operations with negligible impacts of water resources.

Conclusions

Alternative 1 would have a negligible effect on hydrology during the general aviation period and after airport closure.

Because the use of best management practices would continue to prevent water pollution, during the general aviation period Alternative 1 would have a negligible effect with regard to National Pollutant Discharge Elimination System-permitted outfalls for storm water and septic tanks; fuel spills and/or leaks; glycol deicer storage, use, and disposal; aircraft and rental car maintenance operations; and discharges to the Enterprise Canal. Effects on water quality following airport closure would be negligible.

The anticipated impacts would not rise to the level of impairment under Alternative 1 for the following reasons: there would be no measurable impacts; water quality parameters would be well within all water quality standards for the designated use; and quality and flows would remain within historical normal variability conditions.

WILDLIFE AND THEIR HABITATS, INCLUDING SPECIAL CONCERN, THREATENED, AND ENDANGERED SPECIES

Regulations and Policy

Current laws and NPS policies indicate the following desired conditions in Grand Teton National Park with regard to wildlife, their habitats, and special-concern, threatened, and endangered species relative to the presence and operation of the Jackson Hole Airport.

Desired Conditions	Source
Federal and state listed threatened and endangered species and their habitats are sustained.	Endangered Species Act; *Management Policies 2006* (NPS 2006a)
Migratory birds, their parts, nests and eggs are protected.	Migratory Bird Treaty Act
Populations of native animal species function in as natural a condition as possible except where special management considerations are warranted.	*Management Policies 2006* (NPS 2006a)
Biological resources are maintained by minimizing human impact and preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native populations and communities and ecosystems in which they occur.	*Management Policies 2006* (NPS 2006a)
The Jackson Hole Airport resolves wildlife hazard issues by conducting an ecological study and implementing a wildlife hazard management plan.	Wildlife Hazard Management, Title 14, *Code of Federal Regulations,* Part 139.331
Except under specified conditions, the taking, possession and sale of bald and golden eagles is prohibited.	Bald and Golden Eagle Protection Act

Methods

Wildlife impacts were evaluated as described in the "Methods for Analyzing Impacts" section. In addition, the following were used to assess impacts on threatened and endangered species:

- The *Endangered Species Consultation Handbook* (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998) indicates a "not likely to adversely affect" determination is appropriate when the effects on listed species are expected to be discountable, insignificant, or completely beneficial. It defines discountable effects as those that cannot be meaningfully measured.
- The handbook states that a "no effect" determination is appropriate when the "action agency determines its proposed action will not affect a listed species or designated critical habitat" (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998). For the purposes of the National Environmental Policy Act analysis, a "no effect" determination is equated with a "negligible" impact threshold.

The following impact concepts were used for the wildlife resource evaluations:

Population Level Impact: The extent to which a change in habitat, reproductive success, habitat fragmentation, or direct or indirect mortality would be likely to occur.

Human-Caused Disturbance: Implementation and perpetuation of all or part of an alternative would cause or prevent the displacement of individuals.

Potential for "Take": For endangered or threatened species (black-footed ferret, Canada lynx, gray wolf, and grizzly bear), the potential for a "take" to occur is the primary impact measure examined. According to the Endangered Species Act, the term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Impact threshold definitions are as follows for wildlife resources, including migratory birds; raptors; and special-concern, threatened or endangered, and candidate species:

Adverse: Impacts could be direct and/or indirect and may involve the loss of individuals and degradation or loss of habitat. Impacts may affect individuals or populations at a local or regional scale.

Beneficial: Impacts would include increased conservation of individual animals and populations and their habitats on a local and regional scale.

Negligible: *General Wildlife and Species of Concern* - Wildlife would not be affected or the effects would be at or below the level of detection and the effects would be so slight that they would not be of any measurable or perceptible consequence to the population. Mitigation measures are not warranted.

Threatened and Endangered Species - No federally listed species would be affected, or the alternative would affect an individual of a listed species or its critical habitat, but the effects would be so small that it would not be of any measurable or perceptible consequence to the protected individual or its population. Negligible effect would equate with a “no effect” determination in Endangered Species Act terms.

Minor: *General Wildlife and Species of Concern* - Effects on individual animals and/or their respective habitats would be detectable, although the effects would be localized, and would be small and of little consequence to the species’ population. Mitigation measures may be needed and would be successful in reducing adverse effects.

Threatened and Endangered Species - Individuals(s) of a listed species or its critical habitat may be affected, but the effect would be relatively small. Minor would equate with a “may affect” determination in Endangered Species Act terms and would be accompanied by a statement of “may affect but not likely to adversely affect" the species.

Moderate: *General Wildlife and Species of Concern* - Effects on individual animals and their habitat would be readily detectable, with consequences occurring at a local population level. Mitigation measures would likely be needed to reduce adverse effects and would likely be successful.

Threatened and Endangered Species - An individual or population of a listed species or its critical habitat would be noticeably affected. The effect could have some long-term consequence to the individual, population, or habitat. Moderate would equate with a “may affect” determination in Endangered Species Act terms and would be accompanied by a statement of “likely” or “not likely” to adversely affect the species.

Major: General *Wildlife and Species of Concern* - Effects on individual animals and their habitat would be obvious and would have substantive consequences on a population level. Extensive mitigation measures would be needed to reduce any adverse effects and their success would not be guaranteed.

Threatened and Endangered Species - Individuals(s) of a listed species or its critical habitat would be noticeably affected. The effect could have some long-term consequence to the individual, population, or habitat. Major would equate with a “may affect” determination in Endangered Species Act terms and would be accompanied by a statement of “likely to adversely affect" the species.

Short-term: Impact has a duration less than or equal to one year.

Long-term: Impact has a duration greater than one year.

Analysis

Alternative 1 would continue current effects on wildlife and their habitats until 2033. Closure of the airport in 2033 would result in removal of the perimeter fence, restoration of about 128 acres of disturbed and developed area to sagebrush steppe, and elimination of airport traffic and noise. Effects with regard to habitat, aircraft sound, ground vehicles and traffic, and collisions between birds and aircraft for each of these periods are presented below.

Habitat Effects on General Wildlife

Impacts on wildlife in general under Alternative 1 would be negligible until 2033. The airport perimeter fence would continue to exclude browsing by elk, moose, and bison. The sagebrush stand within the airport boundary would continue to be healthy and mature. The habitat conditions outside of the fence would not noticeably change from current conditions through closure of the airport in 2033; wildlife would continue to use these areas in the same capacity and manner that they do currently.

There would be no change in availability of riparian habitat under this alternative and no direct habitat effects in the Snake or Gros Ventre River corridors. These corridors would continue to provide the same habitat elements, including water, vegetation, and cover, before and after airport closure. Birds, mammals, and herptofauna would continue to use this high-quality habitat much the same as they do today. Movement of ungulates within these corridors would not be affected, and the riparian areas would continue to provide critical winter habitat for moose.

Restoration of the disturbed area after airport closure would slightly increase the available shrub cover, while fence removal would allow access onto the entire 533-acre airport site by elk, mule deer, bison, moose, pronghorn, wolves, black and grizzly bears, and cougars. The impact of producing a gain in sagebrush steppe habitat would be long-term, direct, beneficial, and of negligible to minor intensity. Individual animals using this habitat type would benefit from the restoration of 128 acres of sagebrush and access to another 400 acres that formerly were unavailable to them because of the fence. However, these effects would not likely be noticeable at a population level.

Habitat Effects on Migratory Birds and Species of Concern

Prior to 2033, there would be no change in the availability of high-quality sagebrush habitat for use by migratory birds, especially breeding birds. After 2033, about 128 acres of developed areas would be restored to sagebrush conditions. Seasonal migrant birds and species of special concern, including sagebrush obligates such as Brewer's sparrow and sage thrasher, would experience beneficial impacts because of the increased amount of available habitat. The combined habitat effects on migratory birds and species of special concern birds from these changes under Alternative 1 would be long-term, direct, beneficial, and minor.

Raptor use of the airport grounds is limited to occasional foraging and transient flights by resident species. Rare occurrences of ground nesting by short-eared owls or northern harriers may occur. The only other available nesting habitat for raptors is in the short, widely spaced deciduous trees on the southern portion of the airport. Until 2033, there would be no change in raptor foraging conditions or nesting habitat availability. After 2033, restoring sagebrush steppe conditions could improve foraging conditions and nesting availability for some raptors, such as short-eared owls, northern harriers, and Swainson's hawks. Local individuals using this habitat type would benefit from the restoration of 128 acres of sagebrush. However, these effects would not likely be noticeable at a population level. As a result, Alternative 1 would have long-term, direct, minor, beneficial impacts on raptor habitat.

Bald eagles, trumpeter swans, waterfowl, songbirds, and herons would continue to use the Snake and Gros Ventre River corridors for nesting and foraging. Effects on habitat availability for these species would be negligible.

Several bat species may be affected by airport operations prior to 2033. Artificial lighting at the airport would continue to affect the distribution and density of flying insects, because many nocturnal insects are attracted to lights over distances of several miles. Aircraft noise may continue to degrade foraging success in bats that listen for the sounds of insect movement (gleaning bats). However, the airport's light pollution control measures and the voluntary curfew that severely limits airport operations after dark would continue to mitigate effects at night and the impact on gleaning after 2033 would be negligible.

Habitat for special-concern mammals within the airport perimeter would be unchanged until 2033. After the airport closed in 2033, areas within the perimeter fence would be restored to sagebrush habitat, which would provide direct, minor, long-term, beneficial effects on mammalian species of concern.

Habitat Effects on Endangered or Threatened Species

The Endangered Species Act of 1973 requires an examination of impacts on all federally listed threatened or endangered species. In the vicinity of the Jackson Hole Airport, these potentially include the black-footed ferret, Canada lynx, gray wolf, and grizzly bear.

Until 2033, all of these species except the black-footed ferret would continue to be excluded from the airport property by the perimeter fence. Removal of the fence after airport closure would have little effect because of the small area relative to the habitat requirements of the lynx, wolf, and bear, and the absence of any physical site alterations, beyond the restoration of 128 acres of a habitat type that already is widely available in the park. All four threatened or endangered species and their designated critical habitats (if applicable) would experience negligible effects, the equivalent of an Endangered Species Act "no effect" determination.

The U.S. Fish and Wildlife Service does not provide concurrence with a "no effect" determination. Therefore, the NPS requested, and the U.S. Fish and Wildlife Service provided, a letter confirming NPS compliance with section 7 obligations under the Endangered Species Act. This correspondence is included in Appendix A.

Habitat Effects on Greater Sage-Grouse (Candidate Species)

The greater sage-grouse currently is a candidate for listing under the Endangered Species Act. The listing of this species was deemed warranted by the U.S. Fish and Wildlife Service in 2010, but listing is precluded by higher priority listing actions. Section 7 of the Endangered Species Act does not require a determination of effect for candidate species. Therefore, the general wildlife and special concern species impact threshold definitions in the methods section were used in detailing the potential impacts to the greater sage-grouse.

Prior to 2033, changes to sage-grouse habitat or the lek site (see glossary for definition) would not occur under this alternative. The sagebrush steppe habitat within and adjacent to the airport would continue to be used year-round by sage-grouse and provide high conservation value for the species. There would continue to be localized effects from airport operations, including mortality of individual birds and disturbance within the airport lek. Because of the decrease in number of airport operations with the end of scheduled passenger service, these could decrease relative to current conditions, but the change probably would not be detectable, and the impact intensity on the population would be negligible.

After 2033, all airport-related activities would cease and the airport would be restored to sagebrush habitat. Restoration of an additional 128 acres of developed area to sagebrush steppe would result in increased availability of shrub cover, which may provide benefits to breeding and nesting grouse. The impact would be long-term, direct, beneficial, and of minor intensity.

Aircraft Sound Effects on Wildlife

Wildlife responses and apparent impacts vary among species and between individuals of the same species. Variable responses relate to factors such as habitat, the characteristics of the sound and its duration, the perception capabilities of the species, activities at the time of exposure, and past exposure to sound (NPS 1994, Report to Congress). Time of year, duration, and intensity of noise probably also are important. A recent survey of studies documenting the effects of noise on wildlife identified measurable changes in population density for many organisms that are plausibly attributed to noise (Barber *et al.* 2010). Very few studies have focused on the species of interest at the Jackson Hole Airport. Applicable studies include Weisenberger *et al.* (1996) for mule deer and mountain sheep, Krausman *et al.* (2004) and Luz and Smith (1976) for pronghorns, and Blickley *et al.* (2008) for sage-grouse.

Very few quantitative thresholds or benchmarks are available for evaluating sound levels in relation to wildlife species tolerances and impacts. The Wyoming Game and Fish Department (2004) suggested 10 dBA above natural ambient sound as a guideline for protecting sage-grouse habitat for lek, nesting, and brood-rearing uses from human-caused sound effects of gas and oil field development. Similarly, the Bates Hole/Shirley Basin Sage-grouse Working Group (2007) in Wyoming proposed a threshold of “49 decibel (10 A weighted decibels above background noise)” to protect sage-grouse lek use from oil and gas compressor station sounds. However, the basis for these specific thresholds was not defined.

The results of exposing mule deer and mountain sheep to low-altitude jet aircraft flights (less than 400 feet above ground level) where animal heart rates and sound measurements were made during the overflights indicted elevated heart rates from sound levels as low as 72.5 dBA. Rates returned to resting levels within two minutes after overflights that produced sound levels that ranged from 92 to 112 dBA (Weisenberger *et al.* 1996). All animals quickly became habituated to the sound of low-flying aircraft. There were no significant changes in behavior or activity budgets.

The NPS’ Natural Sounds Program prefers the term “learned deafness” rather than “habituation,” because it indicates that animals learn to ignore a sound that they normally would respond to but, in the process, risk missing other important sounds. Learned deafness and masking can have negative effects on some species. For example aircraft sound can:

- Mask wildlife communication, affecting territorial defense, courtship, and breeding behavior; or
- Affect predator-prey interactions, such as masking the sound of an approaching predator (Barber *et al.* 2010).

For two years, Krausman *et al.* (2004) monitored the reactions of endangered Sonoran pronghorn to sound from low-altitude military jet overflights, sound from ordnance, and disturbance because of the presence of other military activities. During the same period, they also monitored a control group of pronghorn at another location. Pronghorn rarely responded to military aircraft, but often moved more than 30 feet when people or vehicles were in the vicinity. Behavior of pronghorn individuals exposed to military activity was similar to behavior of individuals not exposed to regular military activity. Sound levels ranged up to 121 dBA. The average sound pressure level on days with military activity was 65.3 dBA compared to 35.0 dBA on days without military activity. Hearing thresholds measured for pronghorn and desert mule deer were similar, and demonstrate that desert ungulates do not hear sound pressure levels generated from these aircraft (F-16s and A-10s) as well as do humans.

These literature reports suggest that large mammals would be only temporarily affected by loud sound events of aircraft operations and that they quickly acquire a learned deafness to those stimuli. However, Landon *et al*. 2003, found that pronghorn used areas with noise levels below 45 dB more than expected, and areas with noise levels above 55 dB less than expected. Therefore, airport-related noise could be affecting whether some ungulates choose to use some areas in the southern part of the park.

Similar quantitative relationships between sage-grouse and aircraft sound levels were not located in the literature. However, the airport lek site continues to be used annually despite current aircraft operations although, as noted in Chapter 3, lek attendance by males has declined over the past decade and remains below average. As shown the maps in Appendix G, the 15-hour sound energy level in 2015 and 2025 (see Figures G-22, G-24, G-27, and G-29) would have little difference from the sound levels and coverages occurring under baseline (2005) conditions (see Figures G-21 and G-26). As a result, differences in exposure to sound at the airport lek between 2005 and future conditions under Alternative 1 would be small.

Wildlife at the airport would continue to be exposed to noise under Alternative 1 until 2033. Sounds from airport operations and nocturnal lighting would continue to affect habitats within a few miles of the airport and under flight paths. Portions of the Snake and Gros Ventre River corridors would continue to experience non-natural sounds because of airport operations. Aircraft sounds during high-traffic periods may mask natural sounds and could affect ecological processes (Barber *et al.* 2010). Reductions in aircraft traffic through the end of the general aviation phase of Alternative 1 would reduce noise exposure in the area.

Prior to 2033, airport-related sounds associated with Alternative 1 would have negligible effects on wildlife. After 2033, the absence of aircraft sounds following closure of the airport would result in a minor, long-term, direct, beneficial effect on wildlife, with little consequence at the population level.

Effects of Airport Ground Vehicles and Traffic on Wildlife

Because the perimeter fence excludes most wildlife from the airport area, effects from ground vehicles would be limited to small and medium-sized animals. Airport service, security, maintenance, and other ground vehicles are restricted to established roads and work areas within the airport to ensure aircraft and worker safety. Speed limits are strictly enforced. Because of the low presence of wildlife within the airport and standard vehicle safety practices, wildlife vehicle-kill within the airport would continue to be uncommon and would have a negligible adverse impact prior to 2033. Closure of the airport in 2033 would have a negligible beneficial impact by eliminating this source of wildlife mortality.

U.S. Highway 26/89/191, which that provides access to the airport, intersects important deer, elk, bison, moose, and pronghorn migration routes and winter ranges. Several wildlife-vehicle collision hotspots exist along this highway. The traffic analysis indicates that, on closure of the airport in 2033, traffic volume along the 10-mile stretch of highway between the airport and town of Jackson would decline slightly. However, traffic that was related to park visitation and other travel in this road would continue to cause wildlife mortality. Therefore, the long-term, beneficial decrease in wildlife mortality from wildlife-vehicle collisions that would result from airport closure would be of negligible to minor intensity, with little or no consequence at the population level.

Effects of Collisions between Birds and Aircraft

There would be little change to the number of aircraft/bird collisions at the airport through 2033. Collisions would be expected to continue, occurring primarily from March through September, when migrants are in the area. As described in Chapter 3, approximately half of all reported aircraft strikes at the Jackson Hole Airport apparently involved migratory birds, which is consistent with national patterns characterized by Dolbeer's (2006) analysis of the incident records in the Federal Aviation Administration's National Wildlife Strike Database for Civil Aviation for the period 1990-2004.

Based on reported aircraft incidents, raptor collisions are quite rare at the Jackson Hole Airport. There is local evidence that jets of any size are more likely than propeller-driven aircraft to strike birds. The anticipated fleet mix changes under Alternative 1 would likely have negligible beneficial effects on migratory birds, as the ratio of propeller- to jet-propelled aircraft in use at the airport increased at the start of the general aviation phase. There would be a direct, long-term, beneficial effect on migratory birds after 2033, because aircraft would no longer use the area, but the intensity would be minor because of the low number of bird strikes that had occurred previously.

The eight collisions reported with sage-grouse in the past 12 years mostly involved jets, plus one large twin-propeller plane. Aircraft/sage-grouse collisions would probably decrease with the transition and general aviation phases, based on the lower numbers of aircraft and the elimination of scheduled passenger service jets. After 2033, aircraft operations would cease and aircraft collisions with sage-grouse would be eliminated, resulting in a direct, long-term, beneficial, minor impacts.

Cumulative Impacts

Sagebrush steppe habitat acreage is expected to continue declining on private lands south around Jackson and throughout the greater Yellowstone area. The Jackson Hole area has a strong market for primary and second homes and the commercial services that support them. Considerable residential development already has occurred west and southwest of the airport, and additional construction and associated wildlife habitat loss would be expected in this area. Prior to 2033, there would be no changes to availability of this habitat from airport operations. This alternative would not alter the continuing loss of sage-brush habitat in the region.

Loss of other wildlife habitats on private lands also would continue, particularly because of continued development of the Snake River corridor outside the park and national forests. Alternative 1 would have a negligible impact on the loss of riparian and other wildlife habitats because of other past, present, and future foreseeable actions in the area. The beneficial effects associated with restoring the airport site after 2033 would not result in any perceptible or measurable increases in general wildlife or migratory bird populations.

Cumulative impacts on sage-grouse would be adverse because of the continued decline of this species and its habitat in association with development in the region for residential use and production of oil and gas. Ongoing operation of the airport would continue to contribute to the stresses on this species. After 2033, despite the localized, minor beneficial impacts on sage-grouse that would result from the restoration of important age-grouse habitat at the airport site and the elimination of airport-related sounds and aircraft/bird collisions, this species may continue to decline in other parts of the Jackson Hole valley and its entire range.

With decreasing air traffic, collisions between birds and aircraft would decline at the Jackson Hole Airport and would end after 2033. However, increases in such collisions would be expected at other regional airports that had increased air traffic because of flights displaced from Jackson. Similarly, increased wildlife mortality would be expected on roads between those airports and the Jackson area. Thus, the cumulative impact on wildlife because of collisions with aircraft or highway traffic would be negligible.

Conclusions

Until 2033, impacts would be negligible on general wildlife habitat availability and on habitat of migratory birds and species of concern. After 2033, when the airport perimeter fence was removed and developed areas were restored to native vegetation, there would be a negligible to minor, long-term, direct, beneficial impact on these wildlife habitats.

Impacts on habitat of endangered or threatened species would be negligible, which equates to a “no effect” determination under section 7 of the Endangered Species Act.

Prior to 2033, the adverse effects on greater sage-grouse that are associated with airport operations would continue, resulting in a negligible impact. After 2033, the end of airport-related disturbances and mortality, and the restoration of 128 acres of sagebrush habitat, would have a minor, long-term, direct, beneficial impact.

Aircraft sound effects on wildlife would continue until 2033, which would be a negligible impact. Reduced sound exposure that would result from closure would have a minor, long-term, direct, beneficial effect on wildlife, with little consequence at the population level.

Locally, wildlife mortality because of collisions with aircraft or vehicles on roads would decrease. However, a cumulative effect would be an increase in these types of incidents in other locations that had increased air and highway traffic because of flights that had been displaced from Jackson. The net effect on wildlife would be negligible.

Implementation of Alternative 1 would have a negligible contribution to ongoing trends of wildlife habitat loss that are occurring because of development throughout the region.

Impacts on wildlife and their habitats, including special-concern, threatened, endangered, and candidate species, would not rise to the level of impairment under Alternative 1. Prior to 2033, impacts for all wildlife would be negligible, because changes in effects on wildlife or their habitats would not occur, or the changes would be at or below the level of detection and would not cause any measurable or perceptible consequence to wildlife populations. Sage-grouse would continue to experience conditions that might adversely impact individuals but would be unlikely to negatively affect the population. After 2033, impacts under this alternative would be direct, long-term, minor, and beneficial. Thus, the impacts would not adversely affect wildlife and would not cause impairment.

PARK AND AIRPORT OPERATIONS

Regulations and Policies

Current laws and NPS policies indicate the following desired conditions in Grand Teton National Park with regard to park and airport operations relative to the presence of the Jackson Hole Airport. Appendix B provides the full text of the Department of the Interior Airports Act.

Desired Condition	Source
The Jackson Hole Airport is determined by Secretary of the Interior to be necessary to the proper performance of the functions of the Department of the Interior.	Department of the Interior Airports Act
Operation and maintenance of the Jackson Hole Airport are in accordance with the standards, rules, or regulations prescribed by the Secretary of Transportation.	Department of the Interior Airports Act
The Jackson Hole Airport is operated as a public airport, available for public use on fair and reasonable terms and without unjust discrimination.	Department of the Interior Airports Act
Authorized aviation activities at Grand Teton National Park occur in a safe and appropriate manner, and do not cause unacceptable impacts on park resources and values and visitor experiences.	*Management Policies 2006* (NPS 2006a)
The National Park Service works constructively and cooperatively with the Federal Aviation Administration. Cooperation is essential because the Federal Aviation Administration has statutory authorities and responsibilities that must be recognized by the National Park Service.	*Management Policies 2006* (NPS 2006a)
For the general public and for aviation interests, the National Park Service develops educational materials describing the importance of the natural soundscape and tranquility to park visitors, and the need for cooperation from the aviation community.	*Management Policies 2006* (NPS 2006a)
The National Park Service works closely with the Federal Aviation Administration and general aviation organizations to ensure that general aviation operations within Grand Teton National Park are conducted in accordance with applicable Federal Aviation Administration advisories and "fly- friendly" techniques and procedures designed to help pilots minimize impacts on the park, and to resolve any problems that develop because of general aviation use of the Jackson Hole Airport.	*Management Policies 2006* (NPS 2006a)
The Jackson Hole Airport is managed to ensure that the its use will have no unacceptable impacts on park resources and values, public safety, or visitor enjoyment.	*Management Policies 2006* (NPS 2006a)
The Jackson Hole Airport minimizes noise and other impacts, and confines impacts to the smallest and most appropriate portion of the park as possible, consistent with safe aircraft operations.	*Management Policies 2006* (NPS 2006a)

Methods

Impacts on park and airport operations were evaluated using the process described in the "Methods for Analyzing Impacts" section. Impact threshold definitions for park and airport operations are as follows.

Negligible: Park and airport operations would not be affected, or effects would not be perceptible or measurable outside normal variability.

Minor: Effects would be measurable but would not appreciably change park or airport operations. Effects would be perceived by park staff, airport staff, and/or pilots, but probably would not be noted by visitors or scheduled passenger service travelers.

Moderate: Effects would be readily apparent and would result in a substantial change in park or airport operations in a manner that would be noticed by park visitors or scheduled passenger service travelers. Mitigation would probably be necessary to offset adverse effects and would likely be successful.

Major: Effects would be readily apparent and would result in a substantial change in park or airport operations in a manner that would be noticed by park visitors or scheduled passenger service travelers as markedly different from existing operations. Extensive mitigation would be needed to offset adverse effects, and its success would not be assured.

Short-term: Effects would occur only during and shortly after a specified action or treatment.

Long-term: Effects would persist well beyond the duration of a specified action or treatment, or would not be associated with an particular activity such as construction.

The geographic area considered for impacts on park and airport operations included the 533 acres within the airport boundary, plus the road alignment from U.S. Highway 26/89/191 to the airport.

Issues relating to park and airport operations that were identified during scoping included:

- Effects on the NPS' operation of Grand Teton National Park.
- Effects on the use of the interagency helibase.
- Effects on the ability of the National Park Service and Jackson Hole Airport Board to work together.
- Effects on the numbers and types of facilities at the airport within the existing development subzone.
- Potential to expand or construct aboveground or underground facilities outside the current development subzone.
- Effects on airport use and/or operations patterns.
- Effects on the airport's capacity, including air, passenger, and ground traffic.
- Effects on payments from the airport to the U.S. Department of the Interior.
- As a cumulative effect, the potential to accommodate future runway expansion.

Effects on airport funding were addressed in the "Socioeconomics" section.

Analysis

Operation of Grand Teton National Park

Transition and General Aviation Periods. Prior to 2033, the National Park Service would continue to commit staff time for coordination with the Jackson Hole Airport Board and oversight of airport activities. The level of involvement would continue at the rate of one full-time-equivalent NPS position in a normal year. The need for short-term increases in staff requirements would not be anticipated, because general aviation uses could be accommodated with the existing facilities and there would be no need for additional planning to accommodate growth.

There would not be any changes in the management of the area outside the airport fence. Continued management of this area as sagebrush flats and wildlife habitat would require minimal park staff time.

If Alternative 1 were implemented, future planning for public transit by the National Park Service and a partner, such as the Southern Teton Area Rapid Transit (START), would likely not include a transit stop at the airport. During the general aviation period, the airport would support fewer than 80 general aviation operations on a typical day, and most passengers would be unlikely to use bus service that was not conveniently timed to coincide with their plane arrivals and departures. The number of workers required for airport operations would not be enough to justify a transit stop.

In summary, impacts on park operations prior to 2033 would be negligible for:

- Staffing for airport coordination and oversight;
- Management of the area around the airport; and
- Development of public transit services.

Post-Closure. Following the closure of the airport in 2033, the need for airport coordination and oversight would be eliminated. This would increase park staff availability by one full-time-equivalent position per year. This change would not be measurable compared to the normal year-to-year variability in the park's staff level of 200 to 300 people and would have a negligible effect on park operations.

Following closure of the airport, facilities would be removed and the site would revert to natural vegetation dominated by sagebrush. Minimal management would be required to maintain this natural ecological system, and the effect on park operations would be negligible.

After 2033, the airport would not be considered in the NPS' planning efforts related to transit. Its impact on the continued implementation of these plans or programs would be negligible.

Interagency Helibase Operations

Transition and General Aviation Periods. Negligible changes on the operations of the interagency helibase would occur prior to 2033. Water, sewer, and electricity would continue to be obtained from the airport systems, and other services would be obtained independent of the airport. Agencies using the helibase would continue to coordinate flight operations with the Federal Aviation Administration's tower.

Post-Closure. The helibase would be closed and removed concurrent with closure of the airport in 2033. A new interagency helibase would be established on or near already-developed land in the area, and new infrastructure would be installed to support its operations. This would result in negligible to minor, adverse, short-term impacts on helibase operations under Alternative 1. Relocation of the helibase would cause a minor, short-term disruption in operations but would be mitigated to the extent possible. After relocation, the helibase would resume normal operations.

Continued Cooperation

Alternative 1 would have negligible impacts on the effectiveness of the National Park Service and Jackson Hole Airport Board in working together. It would be in the continuing interest of both groups to maintain effective communications and planning to ensure smooth operations throughout the transition and general aviation periods. Such coordination would end in 2033 when the airport was removed from the park.

Airport Facilities within the Development Subzone

Transition and General Aviation Periods. Between now and 2033, the existing facilities within the development subzone likely would be adequate to meet the reduced levels of operations that would be associated with the loss of scheduled passenger service. The Jackson Hole Airport Board may find it appropriate to convert existing buildings, such as the terminal, to other uses. It also would have the option of upgrading or replacing buildings, such as hangars, to meet changing demand, so long as the buildings remained within the height specification of the 1983 agreement. Other infrastructure within the development subzone, such as fuel storage and dispensing, aircraft and automobile parking, administrative space, aircraft rescue and firefighting, and water and sewer, would remain the same or could be reduced to meet the lower demand levels. The impacts on airport facilities would be long-term, direct, and of moderate intensity. Actions singly or collectively could be perceived as beneficial or adverse, depending on personal viewpoints.

Post-Closure. Following airport closure, all of the airport facilities within the development subzone would be removed and the site would be restored to native vegetation. The impacts on airport facilities would be long-term, direct, adverse, and of major intensity.

Airport Facilities outside the Development Subzone

Section 7(a) of the 1983 agreement limits “improvements” to the development subzone. The only exceptions include the additional aircraft parking area within the boundary marked on a map attached to the agreement (all of which has been paved and is in use), and the installation of navigational and safety aids west of the runway.

During the transition and general aviation periods, there would not be any construction or expansion of aboveground or underground facilities outside the current development subzone, except as provided in section 7(a). Closure of the airport in the year 2033 would permanently preclude the possibility of such development in the future. Therefore, Alternative 1 would result in negligible changes on improvements outside the development subzone.

Airport Use and Operations Patterns

Transition and General Aviation Periods. It is assumed that by the end of the transition period in 2015, the airport would lose its Part 139 certification. In the absence of this certification, scheduled passenger air service operating under Part 139 would cease. Relative to the 2005 baseline, this would eliminate about 25% of the airport’s operations, and all of the passenger enplanements associated with scheduled airline service, and would result in a long-term, direct, adverse impact of major intensity on the airport’s use and operations patterns.

With the loss of all scheduled passenger service, ground services other than those supporting general aviation would end. This would include services such as airline ticketing, baggage handling, and security. It probably would not be economically feasible for the rental car agencies, restaurant, or gift shops to continue operating at the airport. Even the fixed-base operator, which would continue to support general aviation, would experience substantial declines in such areas as fuel sales. The result would be a long-term, direct, adverse impact of major intensity on use and operations patterns of the Jackson Hole Airport.

General aviation, including air taxi operations that are conducted under the requirements for commuter and on-demand operations in 14 *Code of Federal Regulations* Part 135, would increase somewhat at the Jackson Hole Airport throughout the transition and general aviation periods. As shown in Table 8 (existing operations) and Table 33 (year 2025 operations under Alternative 1), general aviation operations would increase from the current 24,586 per year to 27,286 per year in 2025. In 2025, general aviation would average about 75 operations per day, compared to current levels of about 65 or 70 per day. However, because the number of general aviation operations in 2025 would be lower than the current total of about 90 daily operations (which includes general aviation plus air carriers and regional carriers), the effect of the general aviation increase throughout the general aviation period would be negligible.

Post-Closure. Closure of the airport in 2033 would eliminate all airport use. The resulting impact on airport use and operations patterns would be long-term, direct, adverse, and of major intensity.

Airport Capacity

Until the year 2033, impacts of Alternative 1 on the capacity of the airport would be negligible. The airport would be able to accommodate the forecast number of aircraft operations using the existing facilities, although some use conversions might be appropriate. Closing the airport in 2033 and removing all of these facilities would have a major, long-term, direct, adverse impact on the capacity of the Jackson Hole Airport.

Payments to the U.S. Department of the Interior

During the transition and general aviation periods, respectively, payments from the Jackson Hole Airport Board to the Department of the Interior would be reduced from the current rate by $30,000 and $50,000 per year. In 2033, these payments would cease. These payments represent less than one half of one percent of the Grand Teton National Park annual budget of more than $13 million. Because this change in revenue could not be perceived compared to the normal range of variability in the budget of the park, the effects of losing this revenue stream would be negligible.

Cumulative Impacts

Alternative 1 would initially reduce and eventually end the Jackson Hole Airport's capability to continue operations of airport facilities. The inability to demonstrate a satisfactory property interest after 2013 would end the airport's eligibility for federal funding, which would effectively limit changes at the airport to those required to maintain basic operations. In 2033, the airport would close. The cumulative effect on park operations and staff would be negligible because of the small staff component that would be affected.

Alternative 1 would divert scheduled passenger service traffic to other airports in the region. Most of this traffic probably would use the Idaho Falls Regional Airport, about 90 miles from Jackson. To handle the number of additional enplanements that currently are occurring at the Jackson Hole Airport, facility improvements would be required to approximately triple the passenger capacity of the

Idaho Falls airport. Substantial upgrades of the Idaho Falls Regional Airport infrastructure would be required, and many practices would have to be modified to handle the increased aircraft operations load. As a result, there would be both beneficial and adverse, major, long-term, direct impacts on operations at this alternate airport site. Additional information on impacts on operations at the Idaho Falls Regional Airport is provided in the "Surface and Air Transportation" analysis for Alternative 1.

Conclusions

For the National Park Service, effects would be negligible on the operation of Grand Teton National Park, planning for transit, ensuring cooperation between the National Park Service and Jackson Hole Airport Board, and the amount of payments to the U.S. Department of the Interior. Negligible to minor, adverse, short-term effects would result to interagency helibase operations.

For the airport during the transition and general aviation periods, impacts on facilities in the development subzone would be long-term, direct, adverse, and of moderate intensity. Negligible impacts would occur on development of facilities outside the development subzone. Beginning in 2015, long-term, direct, adverse impacts of major intensity on use and operations patterns would result from the loss of about 25% of the current average daily air traffic, all scheduled passenger service, and ground services other than those supporting general aviation. Following airport closure, the impacts on airport facilities, use and operations patterns, and capacity would be direct, long-term, adverse, and of major intensity.

PUBLIC HEALTH AND SAFETY

Regulations and Policies

Current laws and NPS policies indicate the following desired conditions in Grand Teton National Park with regard to public health and safety relative to the presence and operation of the Jackson Hole Airport.

Desired Condition	Source
The safety and health of employees, contractors, volunteers, and the public are core Service values. A safe and healthful environment is provided for visitors and employees. Management actions strive to protect human life and provide for injury-free visits.	*Management Policies 2006* (NPS 2006a)
The Service works cooperatively with other federal, tribal, state, and local agencies, organizations, and individuals to carry out this responsibility.	*Management Policies 2006* (NPS 2006a)
Park visitors assume a substantial degree of risk and responsibility for their own safety.	*Management Policies 2006* (NPS 2006a)

Methods

Impacts on public health and safety were evaluated using the process described in the "Methods for Analyzing Impacts" section. Impact threshold definitions for public health and safety are as follows.

Negligible: Health and safety would not be affected, or the effects on public health or safety would not be measurable. Indicators such as numbers of aviation accidents, air medical evacuations for any reason, collisions of aircraft with wildlife, and traffic accidents would be within historical norms.

Minor: Effects would be detectable and would include variations from historical norms for such factors as numbers of air medical evacuations for any reason; and numbers or rates of non-injury, non-fatal aviation accidents, collisions of aircraft with wildlife, and traffic accidents. However, there would not be an appreciable change in public health or safety.

Moderate: Effects could be expressed as changes in numbers of air medical evacuations for health- or life-critical conditions; and numbers or rates of injury-causing (but non-fatal) aviation accidents, collisions of aircraft with wildlife, and traffic accidents.

Major: Changes would be sufficiently large to be readily apparent for such factors as ability to conduct air medical evacuations for health- or life-critical conditions; and numbers or rates of injury-causing and fatal aviation accidents, collisions of aircraft with wildlife, and traffic accidents.

Short-term: Effects would occur only during and shortly after a specified action or treatment.

Long-term: Effects would persist well beyond the duration of a specified action or treatment, or would not be associated with an particular action such as construction.

The geographic area considered for impacts on public health and safety included the:

- Land within the airport boundary;
- Town of Jackson;
- U.S. Highway 26/89/191 corridor between Jackson and Moose; and
- Snake River Valley highway corridor and Teton Pass highway corridor between Jackson, Wyoming and Idaho Falls, Idaho.

Six issues relating to public health and safety were identified during scoping. Five are addressed in this section, including:

- Potential effect of the alternatives on the level of safety associated with airport flight operations.
- Potential effect of the alternatives on health and safety of the community, including flight operations and emergency services such as medical evacuations.
- Potential effect of the alternatives on emergency response services, such as search and rescue and wildland fire fighting.
- Potential effect of the alternatives on public health and safety on highways.
- Potential effect of the alternatives on public health and safety relating to hazardous materials stored and used at the airport.

The potential effects of the alternatives on accidents resulting from aircraft and wildlife (including bird) collisions were addressed previously in the wildlife section.

Analysis

Safety Associated with Airport Flight Operations

Alternative 1 could affect operational components, including elimination of commercial service, availability and updating of navigational aids, available safety equipment and training, refurbishing of facilities, and potential for accidents and incidents.

Elimination of Commercial Service. Eliminating this segment of airport traffic during the transition and general aviation periods would not likely change the number of accidents occurring at the Jackson Hole Airport and would have a negligible effect on public health and safety.

Navigation Aids. The Federal Aviation Administration currently operates the tower and other navigation aids that improve operational safety at the Jackson Hole Airport. During the general aviation period, the tower could be removed or staffing of the tower could be reduced, particularly if the airport was not able to maintain its Part 139 certification from the Federal Aviation Administration. However, the Federal Aviation Administration operates towers at some general aviation airports that do not hold Part 139 certification, such as the Front Range Airport in Denver, Colorado. Factors that the Federal Aviation Administration would consider in its analysis of whether to maintain tower operations at the Jackson Hole Airport throughout the general aviation period include, but would not be limited to, number of aircraft operations, types of aircraft, and site hazards (Piñon 2006).

The air traffic control tower at the Jackson Hole Airport was placed in operation in 2000. Based on the accident information from the National Transportation Safety Board that was presented in the "Public Health and Safety" section in Chapter 3, there is no apparent difference in the number of accidents per year in the 10 years prior to the tower and the 10 years since it has been operating.

A more likely safety effect would result from the inability for the Jackson Hole Airport to obtain future navigation system upgrades. Instead, the Federal Aviation Administration would spend the money for such systems at airports where a satisfactory property interest could be demonstrated. In the near term, the effect probably would be negligible. However, as the capabilities of navigational electronics improved, they could represent substantial differences in the ability to prevent accidents. Under visual flight rules conditions, the effect would be negligible. However, when flight conditions were poor, the long-term, direct, adverse effect on flight safety at the Jackson Hole Airport relative to other airports could be moderate.

Safety Equipment and Training. The absence of Federal Aviation Administration funding relating to the ability to demonstrate a satisfactory property interest would reduce the ability of the Jackson Hole Airport to purchase snowplows, fire trucks, and other safety equipment. Safety and rescue training of personnel also would be reduced as funds were diverted to meet other operational requirements. Following the loss of Part 139 certification, this could result in more accidents associated with aircraft sliding on (or off) icy runways, and less effective response to all types of accidents. There would be a long-term, direct, adverse, moderate effect on safety because of the inability to purchase safety equipment and to provide safe facilities and airport operations.

Refurbishing of Facilities. The absence of Federal Aviation Administration funding could reduce the capability of the Jackson Hole Airport Board to refurbish the runway or taxiway. However, barring major damage such as that caused by an earthquake, the Jackson Hole Airport Board probably could keep these facilities patched sufficiently to allow their use by most general aviation aircraft, particularly smaller models, until 2033. Safety concerns might cause pilots of some larger aircraft to avoid the airport toward the end of the general aviation period, but in addition to improving their own safety, this would improve the safety record of the airport. Because of patching and avoidance, the long-term, direct, adverse effect on safety because of deteriorating facilities probably would be minor.

Effects after Airport Closure. Closure of the Jackson Hole Airport in 2033 would eliminate the potential for aviation accidents at this site. However, the potential for aviation accidents would be transferred to the other airports that received additional aviation traffic that formerly used the Jackson Hole Airport. Therefore, although there would be long-term, indirect effects on aviation-related public health and safety at involved airport sites, the net intensity would be negligible.

Community Well-Being

Emergency Resupply. The Jackson area can experience harsh winter weather, such as blizzards. However, the area is well served by state and federal highways, and emergency service providers in the area are experienced in dealing with such conditions and maintaining sufficient supplies to support essential services. While prolonged inclement weather may cause inconveniences, it would not represent a threat to public health and safety because of the inability to obtain vital supplies. Therefore, changes in the ability to conduct flight operations at the Jackson Hole Airport during the transition and general aviation periods and after airport closure in the year 2033 would have a negligible effect on emergency resupply efforts.

Medical Evacuations. St. Johns Medical Center in Jackson provides comprehensive medical services that are adequate to treat most medical situations. The 50 to 60 cases per year that require medical evacuations by helicopter do not involve the use of the Jackson Hole Airport. Therefore, changes at the airport, including its closure in the year 2033, would have a negligible effect on health- or life-critical medical evacuations that occur by helicopter.

Each year, there are about 80 or 90 medical evacuations from the Jackson Hole Airport, including emergency medical tickets on scheduled passenger service flights.

- Evacuations currently occurring from the Jackson Hole Airport that are critical to a patient's health could be accomplished by helicopter.
- Seriously ill (but not critical) patients who currently are transported by fixed-wing air ambulances could be transported to other hospitals by ground transport. They may experience increased discomfort, because a flight from the Jackson Hole Airport to Salt Lake City takes 50 minutes by air versus six hours by ground (Gutmann 2009), but there would likely be little change in medical outcome.
- For evacuations that are for the convenience of the patient, such as visitors to the area who are trying to catch up to a tour group following the resolution of a medical problem, the same result could be achieved by traveling by car to another airport, such as Idaho Falls, with scheduled passenger service.

Alternative 1 would cause inconveniences, discomfort, or additional costs for some patients who need medical evacuations. However, because the ability to obtain helicopter evacuations for health- or life-critical conditions would not change, the long-term, adverse, direct effect on medical evacuations would be negligible.

Visiting Physicians Services. Air taxi chartered flights that transport medical specialists every week to outlying clinics in Rock Springs and Kemmerer originate near Boise, Idaho, stop at the Jackson Hole Airport to pick up the medical personnel, and then fly to the target city (Avcenter Inc. 2009).

Loss of Part 139 certification at the Jackson Hole Airport may end this practice because of pilot concerns about safety or because the charter company could have difficulty obtaining insurance to use a non-certified airfield. Replacement visiting physician services probably could be arranged for the clinics using in-state doctors from larger Wyoming cities such as Casper or Cheyenne. However, the disruption of current practices would result in a long-term, direct, adverse impact of minor intensity on public health for some Jackson-based medical specialists and some patients in Rock Springs and Kemmerer.

Emergency Response

Emergency response services, such as search and rescue and wildland fire fighting, currently are conducted from the interagency helibase in the airport boundary north of the development subzone. This facility, which functions independently from the airport, would remain in place and operational throughout the transition and general aviation periods. Following closure of the airport, the helibase would be relocated, but its functionality would not be affected. Therefore, Alternative 1 would have a negligible effect on the ability of agencies to provide emergency response to protect public health and safety.

Public Health and Safety on Highways

Consistent with the "Surface and Air Transportation" section of this environmental impact statement, this evaluation assumed the following for visitors who access the area through the airport:

- Airport arrivals equal departures (enplanements).
- All visitors arriving through the airport rent automobiles (as opposed to, for example, joining a bus tour).
- They have the same vehicle occupancy rate as park visitors. In the June-through-August period, the occupancy rate is 2.7 people per vehicle. The occupancy used for the remainder of the year is 2.4 people per vehicle.

Effects on U.S. Highway 26/89/191 between Airport and Jackson. Based on enplanement data from the Jackson Hole Airport and the preceding assumptions, area visitation through the Jackson Hole Airport results in about 200,000 vehicle trips each year. There also are about 500 to 600 vehicle trips per day, or about 180,000 to 220,000 vehicle trips annually, by airport employees (see the "Surface and Air Transportation" section for the bases of these values). It is assumed that 90% of employee trips are associated with scheduled passenger service aviation and 10% are related to general aviation and airport operations. General aviation probably accounts for about 70 vehicle trips per day (one per takeoff or landing operation). All vehicle trips were assumed to be between the airport and the town square in Jackson, a distance of 9.2 miles.

The end of scheduled passenger service by the start of the general aviation period would annually eliminate about 380,000 vehicle trips, or about 3.5 million miles of driving. Based on the accident data in Table 20 for U.S. Highway 26/89/189/191/287 between Moose and Hoback Junction, fatalities would occur at a rate of 1.7 per 100 million miles traveled and injuries would occur at a rate of 77.8 per 100 million miles traveled. Calculations using these values show that:

- Automobile fatalities between the airport and Jackson would decrease by 0.06 people per year, or an average of one person every 16 years.
- Automobile injuries between the airport and Jackson would be reduced by about 3 per year.

From 2001 through 2005, the number of traffic fatalities along the 29-mile stretch of U.S. Highway 26/89/189/191/287 that includes the road between the airport road and Jackson ranged between zero and four fatalities per year (Adams-Gierisch 2006). The expected decrease of one fatality every 16 years would not be detectable compared to these year-to-year variations.

Between 2001 and 2005, the number of automobile-related injuries along the 29-mile stretch ranged between 57 and 75 per year (Adams-Gierisch 2006), with about a third occurring between the airport road and Jackson. A reduction of about 3 injuries per year after 2015 would represent a 12% to 15% reduction along this 9.2-mile stretch and could be detected compared to historical norms. As a result, Alternative 1 after 2015 would have a beneficial, long-term, indirect impact of moderate intensity on highway safety between the airport road and Jackson.

Closure of the airport in 2033 would eliminate all remaining airport-related trips between the former airport site and Jackson, or a total of about 0.4 million miles of vehicle travel per year. The changes in the number of injuries and fatalities from automobile accidents on U.S. Highway 26/89/191 between the airport road and Jackson after 2033 would be so small that they could not be detected compared to historical norms. As a result, the additional beneficial, long-term, indirect impact of Alternative 1 on public health and safety on this road after 2033 would have negligible intensity.

Effects on Travel between Jackson and Idaho Falls. Demand for scheduled passenger service from the area formerly served by the Jackson Hole Airport could be met by airlines flying from the existing Idaho Falls Regional Airport. To drive between these communities:

- Drivers can travel between Jackson and Idaho Falls entirely on U.S. Highway 26, a distance of 108 miles.
- An alternate route involves traveling northwest on Wyoming Highway 22, which turns into Idaho Highway 33 at the state line; turning southwest on Idaho Highway 31 at Victor; and intersecting westbound U.S. Highway 26 at Swan Valley. The distance from Jackson to Idaho Falls by this route is 90 miles.

The former route is 18 miles longer, but the latter route crosses the 8,429-foot-high Teton Pass. It was observed by the Idaho Transportation Department district engineer that "most" drivers select the shorter route (Cole 2006). Therefore, this impact analysis was performed twice, with all displaced airline passenger traffic using the shorter, steeper route, and with traffic split equally between the two routes.

This analysis used the following assumptions.

- The same number of people would continue to access the Jackson and Grand Teton National Park area using scheduled passenger service and general aviation, and the occupancy rates of automobiles would continue to be 2.7 people per vehicle in June through August and 2.4 people per vehicle for the remainder of the year.
- Employees for this airport would be drawn from the local labor pool, and their commutes would be equivalent to the current commute of Jackson Hole Airport employees. Therefore, trips by airport employees were not included in this analysis.
- All visitors would travel by automobile from their airport of arrival to the Jackson town square. From there, they would travel to the same destinations as if they had arrived at the Jackson Hole Airport. Their return trip to the airport to leave the area would be the same.

- The traffic injury and fatality rates on the 6-mile-long segment of Idaho Highway 33 and the 21-mile-long segment of Idaho Highway 31 are similar to the rates on Wyoming Highway 22. These include an injury rate of 88.2 and a fatality rate of 3.6 per 100 million miles traveled. As a result, the average number of traffic-related injuries and fatalities would be proportional to the numbers on the 17.5-mile-long Wyoming Highway 22 (average of 44 injuries and 1.8 fatalities per year, Adams-Gierisch 2006).
- The traffic injury and fatality rates on the 69-mile-long segment of U.S. Highway 26 in Idaho, from the state line to Idaho Falls, are similar to the rates on the 25-mile-long U.S. Highway 26/89 between the state line and Hoback Junction, Wyoming. These include an injury rate of 61.9 and a fatality rate of 3.9 per 100 million miles traveled. It also would have proportional numbers of traffic-related injuries and fatalities as the highway in Wyoming, which includes an average 19 injuries and 1.2 fatalities per year (Adams-Gierisch 2006).

If all 200,000 vehicle trips per year were made over the 90-mile-long Teton Pass route, traffic-related injuries would increase by 13.5 per year and fatalities would increase by 0.67 per year. If half of the vehicle trips per year involved the longer, less steep route, traffic-related injuries would increase by 13.3 per year and fatalities would increase by 0.72 per year.

The changes in the numbers of traffic-related injuries would be readily apparent for both routes, but the change in numbers of fatalities may not be clearly detectable compared to year-to-year variations. If airline passenger traffic that formerly used the Jackson Hole Airport were to relocate to the Idaho Falls Regional Airport, there would be an adverse, long-term, indirect impact of moderate intensity on public health and safety on highways between the two cities.

Jackson Hole Airport closure in 2033 would cause about 120 additional vehicle trips per day associated with displaced general aviation. Some general aviation might relocate to Idaho Falls, but pilots may also use other public airports or private airstrips throughout the region, or could choose other aviation destinations. As a result, the additional adverse, long-term, indirect impact on public health and safety on highways from airport closure would be of negligible intensity.

Public Health and Safety Relating to Hazardous Materials at the Airport

The Jackson Hole Airport Board and fixed-base operator have an excellent record in the safe handling of hazardous materials, including fuels, at the airport. The airport passes a rigorous inspection from the Federal Aviation Administration each year. Their commitment to safety also is demonstrated by the absence of hazardous materials accidents that threatened public health and safety. Because hazardous materials would continue to be handled in a safe manner throughout the transition and general aviation periods, the effect on public health and safety would be negligible. The effect also would be negligible after the airport closed in the year 2033, because there would not be any measurable change in the number of public-health-threatening accidents relating to hazardous materials storage or use, compared to the expected absence of accidents during the pre-closure period.

Cumulative Impacts

Safety Associated with Flight Operations. Eliminating scheduled passenger flights at the Jackson Hole Airport would have a negligible cumulative impact on safety associated with flight operations. Scheduled passenger air service in the United States is extremely safe, and in many years, no fatalities are recorded. This standard of performance would not change if airlines moved their operations to another airport to continue to meet the demand for air travel to the vicinity.

During the general aviation period, there would be a negligible effect on health and safety associated with general aviation at other airports in the region. This would change to a long-term, adverse effect following closure of the Jackson Hole Airport in 2033, when general aviation would be displaced to other airports. There, pilots would be expected to have accidents at rates similar to those of other general aviation pilots using those facilities. The changes at individual airports probably would be detectable, but the intensity would be negligible because it would not result in changes in the overall number of accidents, injuries, or fatalities associated with general aviation in the region.

Community Well-Being. With the end of scheduled passenger service at the Jackson Hole Airport, people using emergency medical tickets, such as visitors to the area who were catching up to a tour group following resolution of their medical problem, would need to obtain the service at another airport. If the Jackson Hole Airport was deemed unsafe, chartered evacuation flights using fixed-wing aircraft also would have to relocate to other facilities. As a result, other regional airports may experience an increase in the number of chartered evacuation flights and/or emergency medical tickets on scheduled passenger service flights, which would be a minor effect. However, because hospital-to-hospital evacuations by helicopter would continue, changes in medical evacuations would have a negligible impact on public health.

Emergency Response Services. Wildland fire fighting and search and rescue services would continue to be provided from the interagency helibase. The cumulative effect of Alternative 1 on the ability of agencies to provide emergency response throughout the region would be negligible.

Public Health and Safety on Highways. Cumulative impacts on public health and safety on highways would be triggered by the need for passengers who now access the area through the Jackson Hole Airport to fly into another airport and then drive substantial distances to get to Jackson. These cumulative effects would be closely tied to the indirect impacts that were discussed previously under "Analysis."

Hazardous Materials. The transfer to other airports of scheduled passenger service by 2015 and general aviation by 2033 would result in the increased storage and use of hazardous materials, such as fuels, lubricants, and solvents, at those airports. Those airports are required to meet the same safety standards as the Jackson Hole Airport and to pass the same rigorous inspection from the Federal Aviation Administration each year. Therefore, changes in the location of use of these substances that would result from Alternative 1 would have a negligible effect on public health and safety.

Conclusions

During the general aviation period, long-term, direct, adverse effects on safety of moderate intensity would result from the inability of the Jackson Hole Airport to install upgraded navigational aids; purchase snowplows, fire trucks, and other major pieces of safety equipment; and maintain rescue training at current levels. Minor, long-term, direct, adverse effects would result from reduced maintenance of the runway and taxiway and from reduced availability of medical evacuations for non-critical conditions. Life- or health-critical medical evacuations would experience negligible effects, but visiting physician services could experience long-term, direct, adverse impacts of minor intensity.

A long-term, direct, beneficial effect at the site would result from closing the airport in 2033, because all potential for aircraft accidents would be eliminated. However, because similar numbers of additional aircraft accidents would be expected at the airports that would be handling the former airport's air traffic, the regional effect would be negligible.

Changes in public health and safety on highways would be directly related to changes in automobile traffic volumes. Decreases in traffic on U.S. Highway 26/89/191 between the Jackson Hole Airport and Jackson would have a beneficial, long-term, indirect impact of moderate intensity on highway safety. Increases in traffic on roads between Jackson and the Idaho Falls Regional Airport would have an adverse, long-term, indirect impact of moderate intensity.

Throughout the transition and general aviation periods and following airport closure, Alternative 1 would have negligible effects on public health and safety with regard to flight operations that provide vital safety links; emergency response services, such as search and rescue and wildland fire fighting; and the handling of hazardous materials.

SOCIOECONOMICS

Regulations and Policies

Current laws and NPS policies indicate the following desired conditions in Grand Teton National Park with regard to socioeconomics relative to the presence and operation of the Jackson Hole Airport.

Desired Condition	Source
The National Park Service collaborates with industry professionals to promote sustainable and informed tourism that incorporates socioeconomic and ecological concerns and supports long-term preservation of park resources and quality visitor experiences	*Management Policies 2006* (NPS 2006a)
The National Park Service works cooperatively with others to address mutual interests in the quality of life of community residents, including matters such as compatible economic development.	*Management Policies 2006* (NPS 2006a)

Methods

Impacts on socioeconomics were evaluated using the process described in the "Methods for Analyzing Impacts" section. Impact threshold definitions for socioeconomics are as follows.

Negligible: The socioeconomic environment would be basically unchanged, with very small or no detectable change in local socioeconomic indicators such as economic activity, employment, and the structure of primary local industry sectors, such as retail, services, and construction.

Minor: Localized, small, but measurable changes in some socioeconomic indicators would occur, such as levels of employment, business sales, personal income, or the structure of primary industry sectors.

Moderate: The effects on socioeconomic indicators would be readily apparent in the local economy and would be measurable in the economy of Teton County, Wyoming. Indirect impacts on socioeconomic resources would occur as a result of the direct economic impacts.

Major: Widespread, readily apparent regional changes would occur in socioeconomic indicators, such as economic activity, employment, income, and/or the structure of primary industry sectors in Teton County.

Short-term: Effects would extend over only a temporary, interim period as a result of the implementation of a given action.

Long-term: Effects would extend over a prolonged period of time.

Direct and indirect: To avoid confusion, it is useful to clarify direct effects and indirect effects (or impacts) as they are used with regard to socioeconomics versus the National Environmental Policy Act.

For socioeconomics, direct effects relate to purchases or payrolls that occur because of an action or project. For example, the purchase of a meal in a restaurant is an action. The direct economic effects include the proprietor's purchase of food, and receipt of wages by the waiter. Indirect effects occur when the waiters purchase their own groceries from their earnings, and when sales tax revenues to governments increase because of the purchases made both by the restaurateur and the waiters.

With regard to the National Environmental Policy Act, a direct effect is immediately related to the action. For projects involving construction, this relationship is similar to that described above for a direct economic effect: the construction involves payments to workers and purchases of goods and services needed to build the structure. However, the proposed extension of the 1983 agreement for the Jackson Hole Airport is an administrative action. Therefore, *all of the socioeconomic impacts associated with the alternatives would be indirect effects* under the National Environmental Policy Act, as illustrated by this chain of events:

- If the 1983 agreement is not extended, the Jackson Hole Airport Board would be unable in 2013 to show a satisfactory property interest, extending at least 20 years, in the land under the airport.
- Under Title 14, Part 152 of the *Code of Federal Regulations,* section 152.103, the inability to demonstrate a satisfactory property interest would make the Jackson Hole Airport ineligible to receive funding from the Airport Aid Program.
- Without Airport Aid Program funding, which includes grant funds under the Airport Improvement Program and passenger facility charges, the Jackson Hole Airport, in time, would not be able to pass the annual certification inspection from the Federal Aviation Administration that is required under Title 14, Part 139 of the *Code of Federal Regulations*.
- If the airport did not maintain its Part 139 certification, scheduled passenger service air carriers and regional carriers would not fly into the airport.
- If scheduled passenger service air carriers and regional carriers did not transport a visitor to the area, that visitor might not purchase lodging or a meal in a restaurant, with the resultant economic effects.

Geographic area: The primary geographic area considered for impacts on socioeconomics included the town of Jackson and Teton County, Wyoming. Because of their strong economic ties with the primary area, some effects occurring in Lincoln County, Wyoming, and Teton County, Idaho also were included.

Issues: Nine issues relating to socioeconomics were identified during scoping. They included:

- Effects on the economy of Jackson and the region, including growth, income, and contribution to the local economy.
- Effects on recreation outside Grand Teton National Park.

- Effects on airport use and demand for airport services (general).
- Effects on general aviation use of the airport.
- Effects on scheduled passenger service use of the airport.
- Effects on the availability and use of airport services by area residents.
- Effects on the airport's operations revenues.
- Effects on Federal Aviation Administration funding.
- Effects on quality of life factors in Jackson and the region.

Analysis

Effects on the Economy of Jackson and the Region

Maintaining the existing agreement and not extending its term would result in the transition of the Jackson Hole Airport to general aviation only by about 2015 and airport closure in 2033. The changes associated with both dates would have long-term, indirect, adverse economic impacts of major intensity on the town of Jackson and Teton County.

The largest sector of the area's economy is tourism, and area employment, earnings, business volume, real estate, and construction are dominated by tourism-related activity. Surveys conducted on tourism and visitor spending indicate that 25% to 35% of total employment and more than 25% of total salary and wage income in Teton County is the direct result of tourism. It is estimated that 35% to 40% of the total economic impact of non-local visitors and tourism is directly related to air transportation through the Jackson Hole Airport.

Between 65% to 75% of the economy is not directly related to tourism. However, these segments, which include construction, government, retail trade, professional and technical services, and finance and insurance, also experience substantial benefits from the presence of the airport. Economic modeling shows that the direct and indirect economic effects resulting from the Jackson Hole Airport probably account for 25% to 30% of the local economy.

Scheduled passenger service at the Jackson Hole Airport would decrease during the transition period and would end around 2015. This would increase the time required to get to the area for the 274,000 annual passengers who currently (2006 data) use the Jackson Hole Airport. As a result, many tourism-related passengers may choose another location for their recreation, particularly during the winter when access to the area by other transportation modes can be challenging (see the "Surface and Air Transportation" section).

The resulting economic impacts would be apparent and widespread throughout the region. The accommodations and food sectors would experience the most immediate effects, followed by the construction, retail trade, and public service sectors. The direct economic impacts would be in the form of decreased business volume, lost personal salary and wage income, and lost employment.

These adverse, direct economic impacts would result in indirect economic impacts on other elements of the local and regional economy. For example:

- The loss of convenient access by air transportation into the region may reduce demand for housing. This would result in reduced housing values.

- The loss of demand for housing and supportive services would reduce activity in the construction and real estate industries.
- Government revenues would be reduced because of the loss of sales taxes and property tax revenues. The reduced government revenue could adversely impact the ability to provide public services, such as police, fire, and rescue, and would reduce funding for the maintenance of existing community infrastructure, such as roads, and construction of new facilities.

Adverse impacts also would occur in Lincoln County, Wyoming, and Teton County, Idaho, primarily in the form of reduced employment and personal income.

During the transition and general aviation periods, the impact on second homes owned and used seasonally by non-residents is difficult to assess. The second-home segment of the housing market in Teton County, Wyoming generally represents high-income individuals. Many of these people may own an aircraft, or may use charter air services to continue to fly into the Jackson Hole Airport. However, because second homes represented more than 20% of the total housing inventory in 2000 (see the "Demographics, Housing" section), decreases in desirability of the area because of reduced access by air could have a substantial adverse effect on the county-wide housing market.

Closure of the airport in 2033 would have limited additional effect on tourism. However, the inability to access the area by general aviation would make the area less attractive to some high-income individuals who had continued to fly into the airport in personal or chartered private aircraft. The adverse economic impacts of losing the ability to access the area by general aviation would be most apparent in the construction, real estate, professional and technical services, and finance and insurance sectors.

Table 31 (Estimated Total Airport Annual Economic Impacts, 2005) showed that the economic impact of the Jackson Hole Airport in 2005 included about $400 million in non-local visitor spending, the existence of more than 6,250 jobs, and more than $160 million in annual personal income in the form of salaries and wages. Closure of the airport in 2033 could result in the partial or total loss of all of these economic resources, which represent 25% to 30% of the local economy. Effects would be least apparent in the summer, when the 90% to 94% of area visitors who currently access the area by automobile or bus would continue to arrive. Effects would be more severe in the winter, when up to 90% of area visitors arrive through the Jackson Hole Airport.

Effects on Recreation outside Grand Teton National Park

Summer. Summer visitation to Jackson is primarily by automobile, with surveys indicating that between 6% and 12% of the area's summer visitors arrive by air transportation. If the Jackson Hole Airport was not available, many of these visitors might choose an alternate destination for their visit. However, many others would simply choose another airport (such as Salt Lake City, Bozeman, or Idaho Falls) and still visit the area. As a result, Alternative 1 would have a minor, long-term, indirect, adverse impact on summer recreation outside Grand Teton National Park.

Winter. Three ski resorts, including the Jackson Hole Mountain Resort, Snow King Resort, and Grand Targhee Resort, plus the town of Jackson, are the primary winter visitor destinations in the region. Visitors can access the Grand Targhee Resort equally well through the Idaho Falls Regional Airport and Jackson Hole Airport, but about 90% of the winter visitors to Jackson and the other two resorts arrive by air using the Jackson Hole Airport during the December through March period. The airport also is an important gateway for visitors recreating in the national forests outside the developed ski facilities, and at the National Elk Refuge. Lower percentages of visitors use the Jackson

Hole Airport to access winter recreation at Yellowstone National Park and the White Pine Ski Area south of Jackson. The direct impact of non-local winter visitor spending in Teton County is estimated at $90 million to $123 million.

By about 2015, scheduled passenger service at the Jackson Hole Airport would end. This action may have a minor adverse impact on the Grand Targhee Resort, which would have no change in its current accessibility through the Idaho Falls Regional Airport. However, substantial decreases in non-local visitor winter recreation at the other two resorts and the town of Jackson would occur because of the time required to get to the area. Some people may choose alternate modes of transportation into the area, such as flying to Idaho Falls or Salt Lake City and traveling by road to Jackson (see the "Surface and Air Transportation" section). In addition, some affluent visitors would use private aircraft, such as charters or their own planes, to fly into the Jackson Hole Airport. However, it is likely that many potential winter visitors to the area would choose another, more accessible destination for their winter vacation.

The Snow King Resort, which is adjacent to Jackson and has a substantial local clientele, probably would continue to operate, although at a reduced level. Other winter recreation-related businesses or operations, such as the sleigh rides at the National Elk Refuge, also may continue at reduced levels. Others may go out of business. The loss of winter visitors could result in a reduction in the permanent population of the area. Loss of employment, especially in the services sectors and at prime destination points (ski resorts), would result in out-migration of workers directly and indirectly employed in tourism-related jobs. Loss of employment would result in related decreases in personal income, business sales, expenditures, and sales tax and other use tax revenues. As a result, beginning during the general aviation period, Alternative 1 would have a long-term, indirect, adverse economic impact of major intensity on winter recreation in Teton County, Wyoming.

After the airport closed in 2033, visitors wanting to participate in winter recreation outside the park would not be able to fly into the area by general aviation. However, because they would represent a very small part of the recreating public, they would have little additional impact on winter recreation in the area.

Effects on Airport Use and Demand for Airport Services (General)

About 33,000 operations (average of 90 per day) occurred at the Jackson Hole Airport in 2005 (see Table 8). With the loss of scheduled passenger service around 2015, the number would decrease to about 26,400 annual general aviation operations or about 72 per day (see Table 33). Scheduled passenger enplanements would decline to zero.

Airport use and services would dramatically change. While use of the airport for general aviation would continue, the fixed-base operator would have decreased demand for aviation fuel, aircraft maintenance, ground equipment maintenance, and other services. The need for ground transportation services would be virtually eliminated, adversely affecting the rental car, taxi, shuttle, and limousine companies that currently serve the airport. The restaurant and gift shop would close. Other tenants at the airport also would be adversely affected by the decline in demand for their products and services. It is estimated that 90% of the current onsite employment of 485 people would end (Bishop 2007a). On closure of the airport in 2033, all existing operations would cease.

As described in Table 29 in the "Affected Environment" section, on-airport annual economic activity is responsible for $10 million to $15 million in local and regional expenditures, $12.5 million to $16.5 million in personal income, and 470 to 540 jobs. On closure of the airport, these economic impacts would no longer be realized by the local and regional economy. The result would be an adverse, indirect, long-term impact of major intensity on the local and regional economy.

Effects on General Aviation Use of the Airport

Under Alternative 1, general aviation, including charters, corporate jets, and personally owned aircraft, would increase from the 2005 baseline of 24,586 operations to 27,286 in 2025. Potentially, this number could increase even further if the absence of scheduled commercial service created an additional demand for air taxis such as charters and fractional ownership, although the high costs of such service would likely temper any increase. The additional general aviation operations would have a long-term, indirect, beneficial impact of minor intensity on the economy during the general aviation period.

The Jackson Hole Airport receives only a small part of its current annual operating income from general aviation operations. This income includes landing fees, fuel, and maintenance. Landing fees are the largest component, and totaled approximating $140,000 for general aviation in fiscal year 2004/2005. It is expected that airport revenue from landing fees and other sources related to general aviation would increase throughout the general aviation period, proportionately with the expected increase in general aviation operations at the airport.

The Jackson Hole Airport Board may consider raising it rates and charges to a level that would generate the money necessary to fund capital improvement projects. However, current rates and charges generally are at “market” rates. Substantially raising rates and charges might be challenged as violating the “fair and reasonable” provisions of the 1983 airport agreement.

All revenues from general aviation would be applied to the highest priority maintenance projects to keep the airport operational. However, without Federal Aviation Administration funding, gradual deterioration of the runway and taxiways eventually could create conditions that some pilots would consider unsafe. As a result, general aviation operations may decline toward the end of the general aviation period.

After 2033 the airport would be closed, with all aviation operations and activities ceasing. This would result in the loss of the remaining jobs, estimated as fewer than 50 (Bishop 2007a), that would be associated with the airport in 2033, plus the end of the economic activity that had developed to support the transport of visitors to the area by general aviation charters. The intensity of the resulting long-term, indirect, adverse impact on the economy would be moderate.

Effects on Scheduled Passenger Service Use of the Airport

Currently, scheduled passenger airline service to the airport is provided by four carriers. The number of scheduled passengers they transport varies seasonally, but during the peak season there are about 12 to 20 regularly scheduled arrivals and an equal number of departures each day, totaling 24 to 40 daily operations.

Under Alternative 1, scheduled passenger service would decrease during the transition period and would end around 2015. Between then and 2033, only general aviation operations would occur at the airport. Passenger enplanements, which by definition are associated exclusively with scheduled air carrier and regional carriers service, would not occur. The closure of the airport in 2033 would have no additional impacts on scheduled passenger air service, because such service was terminated around 2015.

The termination and absence of scheduled passenger air carrier service to the Jackson area would have long-term, adverse, indirect impacts of major intensity on the local and regional economy. These impacts were discussed previously under the heading “Effects on the Economy of Jackson and the Region.”

Effects on Availability and Use of Airport Services by Area Residents

When scheduled passenger services ended around 2015, area residents would no longer have convenient access to major cities nationwide through the airport. Because general aviation charters are substantially more expensive, they would not meet the travel needs of most local residents. Therefore, most residents would have to travel by road to another facility, such as the Idaho Falls Regional Airport to find this service. Winter would be the season that would result in the greatest disruption to travel plans of area residents because of the challenging nature of driving on often-icy mountain roads. The inconvenience could cause some residents and businesses to relocate. The intensity of the long-term, indirect, adverse impact would be perceived as moderate by most area residents, and major for those who felt compelled to move away from the area because of the decreased air service. Closure of the airport in 2033 would not result in any additional effects on the travel inconveniences experienced by these local users.

Despite the cost, use of airport services by chartered general aviation flights and business-related air transportation would increase moderately during the general aviation period. In the space freed up by the loss of scheduled passenger service, the Jackson Hole Airport Board might construct new hangars, or it could refurbish or replace existing hangars to better meet the new demand. This could provide additional operating revenues for the airport. This would result in a long-term, indirect benefit of minor intensity that would end when the airport closed in 2033.

Elimination of convenient access to the rest of the nation by scheduled passenger air service from the Jackson Hole Airport would result in the Jackson area becoming less attractive for future development. In particular, the second home market, which makes up more than 20% of the housing inventory, could be adversely impacted.

Effects on the Airport’s Operations Revenues

Operating income from scheduled passenger service would decline throughout the transition period and would end around 2015. This loss would represent more than 90% of the annual operating budget for the airport. Operating revenues would increase slightly over time as general aviation increased, but the net impact throughout the general aviation period on airport operating revenues would be long-term, indirect, adverse, and of major intensity.

After 2033, there would not be any operating revenues, but the impact would be negligible because the airport would be closed.

After the airport closed in 2033, the Jackson Hole Airport Board would be required to remove the terminal building. If local public revenues were required for its demolition, there would be a minor, short-term, adverse impact. However, the Board may be able to negotiate its removal in return for the right to salvage its materials. In that event, the impact would be negligible.

Effects on Federal Aviation Administration Funding

In 2013, the Jackson Hole Airport would lose its eligibility to Federal Aviation Administration grant funding. More than 70% of all monies that are available to the Jackson Hole Airport Board for facilities maintenance and capital improvements are from Federal Aviation Administration grant funds under the Airport Improvement Program and passenger facility charges.

Capital improvement projects that are planned between now and 2011 are classified as "maintenance / refurbishment." The Jackson Hole Airport Board just completed (2008) a $3.2 million rehabilitation of the taxiways. The Jackson Hole Airport Board is now planning to secure Federal Aviation Administration grant funding to repair the runway electric system. Under Alternative 1, these projects probably would not be completed, and other projects would never be considered.

Federal Aviation Administration grant funding for the Jackson Hole Airport averages about $3 million per year. On a regional basis, the loss of this funding would directly be a minor adverse effect, but it would trigger the series of actions that would result in the loss of scheduled passenger service at the airport, and the widespread economic effects that were described previously. Before 2033, its loss would result in a major, long-term, indirect, adverse impact on the airport, town of Jackson, and three-county region. After 2033, the airport would have been closed.

Effects on Quality of Life Factors in Jackson and the Region

"Quality of life" is highly subjective, and the same condition can be perceived as adverse, neutral, or beneficial by people who hold different viewpoints. Therefore, this section summarizes some of the long-term changes that could alter perceptions about the overall quality of life in Jackson and the surrounding area without identifying intensities or classifying them as adverse or beneficial.

The termination of scheduled passenger service around 2015 and closure of the airport in 2033 would reduce how often sound was audible, and would reduce and then eliminate the intrusion on the scenic landscape that some people associate with low-flying aircraft.

Removal of the airport in 2033 would eliminate a feature that some consider an intrusion in the scenic landscape and aesthetics of Grand Teton National Park.

Reductions in highway traffic would result from the elimination of traffic directly related to visitors who arrived by scheduled airline service, and traffic that formerly was associated with the workers who provided services to these visitors. This change would be apparent primarily in the winter.

Alternative 1 would reduce salary and wage income, and the number of jobs. This could lead to a population loss as people relocated outside of the area for employment purposes.

Housing values could decrease as a result of increasing market supply that would be caused by such factors as diminished demand, reduced attractiveness in owning a second home in the area, and the relocation of some households outside the area.

Reduced public revenues could result in a reduction and/or deterioration of community and public services, such as police, fire, and rescue.

Travel to other parts of the nation and back would become less convenient for area residents and business employees.

Cumulative Impacts

With the end of scheduled passenger service around 2015, and with the closure of the airport in 2033, many of the economic benefits that currently are accruing to Jackson, Teton County, and the surrounding region from airport operations would be transferred to other communities.

- Demand for scheduled passenger service would be accommodated by another airport in the region, such as the existing Idaho Falls Regional Airport. A discussion of how this demand might be met is included in the "Surface and Air Transportation" section. Although the demand for scheduled passenger service could be lower than the levels that would have occurred at the Jackson Hole Airport, it could be sufficiently large to have a moderate beneficial impact on a large community such as Idaho Falls.
- Any regional airport, including the Idaho Falls facility, would need substantial upgrades to handle the additional passenger traffic that would result from Alternative 1. To meet this need, they would be expected to receive considerable Federal Aviation Administration grant funding. This funding would have a major beneficial impact on any regional airport. At the larger, community level, it would have a moderate beneficial impact on a large community such as Idaho Falls.
- After the Jackson Hole Airport closed in 2033, demand for general aviation would be met at other public and private airfields in the region. Because this demand would be dispersed among many facilities, the intensity of the beneficial economic impact at any individual site would be negligible or minor.
- After scheduled passenger service ended, many potential winter visitors would choose another, more accessible destination. The selected destinations would receive the economic benefits of the monies spent for such items as travel, lodging, meals, lift tickets, and equipment rentals. It has been suggested that the Big Sky Resort in Montana, and the Alta Ski Area and Park City Mountain Resort in Utah could be potential beneficiaries. However, visitors could choose among many major ski areas in the western United States, or could even decide to take a European vacation. As a result, the intensity of the beneficial economic impact at any individual area probably would be minor.

This analysis assumed the Jackson Hole Airport would lose its Part 139 certification. Organizations such as the Wyoming Aeronautics Division and Wyoming Business Council could potentially provide some funds to the Board. However, it is unlikely that such funding would fully compensate for the loss of Federal Aviation Administration grants or be sustainable for more than a short time.

The planning efforts of public agencies and private entities throughout the region have been based on the continued presence and operation of the Jackson Hole Airport for scheduled passenger service and general aviation. Some of the planning that would be disrupted by Alternative 1 includes, but is not limited, to the following.

- The recently approved expansion of Teton Village and development of other private lands within the Jackson area could be affected by the decrease in demand for housing in the area.
- Increased supportive commercial development within the region may not occur under this alternative because of the decline in demand.
- Construction plans for new lifts, housing, and commercial facilities at the three ski resorts could be delayed under this alternative. The Grand Targhee Resort master plan includes a proposal to more than triple its current skier capacity. The Jackson Hole Mountain Resort and Snow King Resort also have master plans that include expansion of current skier capacity and supportive facilities.

- The National Park Service recently completed a transportation plan for Grand Teton National Park (NPS 2006b) that includes the development of a transit business study. Both may require substantial modifications if Alternative 1 was implemented.
- The *Transit Development Plan 2003 Update* (Southern Teton Area Rapid Transit 2003) has been adopted by the Town of Jackson and Teton County, and includes transit planning for the Jackson Hole Airport. Alternative 1 could eliminate the Jackson Hole Airport from consideration as a transit stop.

There are several land use plans, controls, and policies for the Jackson area that are potentially associated with actions at the Jackson Hole Airport. These include:

- The Jackson/Teton County Comprehensive Plan (2002) states that airport issues are to be addressed in the future, and includes a strategy of supporting continued service at the Jackson Hole Airport while minimizing environmental and traffic impacts. The plan also contains a number of guiding principles, which include "create conditions for a sustainable visitor-based economy not dependent upon growth."
- The Jackson Hole Airport Resolution, which is an addendum to the *Jackson/Teton County Comprehensive Plan*, contains special sections on height and noise regulations as related to development in the immediate airport area. Under this resolution, height restrictions for structures are imposed in zones near the airport that are associated with approach, and along instrument and non-instrument runway flight paths.
- The Grand Teton National Park master plan (NPS 1976) seeks to minimize the intrusive impacts of the airport into the surrounding natural environment. This goal would be best accomplished under Alternative 1 with the closure of the airport.
- *Winter Use Plans for Yellowstone National Park and Grand Teton National Park.* The winter use plans are applicable under Alternative 1 because of the elimination of scheduled passenger service to the area in 2015. In the winter, most visitors to Grand Teton National Park and Yellowstone National Park arrive by air. Implementation of this alternative would affect the number of visitors to these parks in winter.
- The National Park Service recently prepared the *Final Bison and Elk Management Plan and Environmental Impact Statement for the National Elk Refuge / Grand Teton National Park / John D. Rockefeller, Jr. Memorial Parkway, Teton County, Wyoming* (The U.S. Department of the Interior, U.S. Fish and Wildlife Service and National Park Service 2007). Implementation of Alternative 1 would affect management zoning and other elements of this plan as they relate to visitor experience, resource conditions, and aircraft activities.

Conclusions

Alternative 1 would eliminate scheduled passenger service at the Jackson Hole Airport around 2015 and would result in closure of the airport in 2033. The changes associated with both dates would have long-term, indirect, adverse impacts of major intensity on the town of Jackson and Teton County, Wyoming. Adverse impacts also would occur in Lincoln County, Wyoming, and Teton County, Idaho, primarily in the form of reduced employment and personal income. Socioeconomic components that would contribute to this condition would include the following.

- For recreation that occurs in the region outside Grand Teton National Park, this alternative would have long-term, indirect, adverse impacts. The intensity would be minor in the summer and major in the winter.

- On the airport site, the termination of scheduled passenger service, with its associated jobs, purchases, and services, would have an adverse, indirect, long-term impact of major intensity on the local and regional economy. Additional impacts associated with the subsequent termination of general aviation operations would be moderate, long-term, indirect, and adverse.
- The off-airport loss of jobs, purchases, and services associated with the termination of passenger service would have long-term, adverse, indirect impacts of major intensity on the local and regional economy. Additional losses associated with the subsequent termination of general aviation would be minor to moderate.
- The end of locally available scheduled passenger service would have moderate to major, long-term, indirect, adverse effects on most local residents and businesses.
- The loss of more than 90% of the airport's operating revenue with the termination of scheduled passenger service would be long-term, indirect, adverse, and of major intensity for the airport. After 2033, there would not be any operating revenues because the airport would be closed.
- The loss of more than 70% of airport funding for facilities maintenance and capital improvements would have a major, adverse effect on the airport. More importantly, it would trigger the series of actions that would result in the loss of scheduled passenger service at the airport, and the associated, widespread socioeconomic effects.
- The effects on quality of life would depend on personal perceptions.

SURFACE AND AIR TRANSPORTATION

Regulations and Policies

Current laws and NPS policies indicate the following desired conditions in Grand Teton National Park with regard to transportation relative to the presence and operation of the Jackson Hole Airport.

Desired Condition	Source
Transportation solutions at Grand Teton National Park preserve natural and cultural resources while providing a high-quality visitor experience.	*Management Policies 2006* (NPS 2006a)
The National Park Service evaluates and manages aircraft landing sites under its jurisdiction to ensure that the use of the sites will have no unacceptable impacts on park resources and values, public safety, or visitor enjoyment. Existing sites that meet these criteria and that have been designated as a result of previously established use may be retained as long as the administrative need for them continues.	*Management Policies 2006* (NPS 2006a)
The National Park Service works with entities having jurisdiction over landing sites and airports for the purpose of preventing, reducing, or otherwise mitigating the effects of aircraft operations. The objective is to minimize noise and other impacts and confine them to the smallest and most appropriate portion of the park, consistent with safe aircraft operations.	*Management Policies 2006* (NPS 2006a)

Methods

Impacts on transportation were evaluated using the process described in the "Methods for Analyzing Impacts" section. Impact threshold definitions for transportation are as follows.

Negligible: Local and regional transportation would not be affected, or the effects would not be measurable. Changes in transportation modes, facility locations, traffic volumes, and levels of service would be within the range of variability of historical norms.

Minor: Effects on transportation in the southern part of the park and around Jackson would be detectable and would include measurable variations from historical norms for such factors as transportation modes, facility locations, traffic volumes, and/or levels of service. These changes would not be detectable regionally, for the area defined below.

Moderate: Effects on transportation in the southern part of the park and around Jackson would be readily apparent and would include substantial changes from historical norms for such factors as transportation modes, facility locations, traffic volumes, and/or levels of service. These changes would be detectable regionally, for the area defined below.

Major: Effects on transportation would be readily apparent regionally and would include substantial changes from historical norms for such factors as transportation modes, facility locations, traffic volumes, and/or levels of service.

Short-term: Effects would occur only during and shortly after a specified action or treatment.

Long-term: Effects would persist well beyond the duration of a specified action or treatment, or would not be associated with an particular activity such as construction.

The geographic area considered for impacts on transportation included northwestern Wyoming and eastern Idaho. For illustrative purposes only, it was assumed that in Alternative 1, airport services for the area would be relocated to the existing airport at Idaho Falls, Idaho. Therefore, the regional area in which changes in transportation modes, facility locations, traffic volumes and/or levels of service primarily would occur would include:

- U.S. Highway 26/89/191 between the Jackson Hole Airport and town of Jackson.
- The Snake River Valley highway corridor and Teton Pass highway corridor between Jackson, Wyoming and Idaho Falls, Idaho. This includes several highways, including U.S. Highways 26, 89, and 191; Idaho Highways 31 and 33, and Wyoming Highway 22.

Prior to 2033 for Alternative 1, the relocation of airport services to an assumed Idaho location would include only scheduled passenger flights. After closure of the Jackson Hole Airport in 2033 in Alternative 1, general aviation also would relocate to other facilities.

Effects on air-related emergency services, including medical evacuations, already were considered under "Public Health and Safety." The other transportation-related issues that were identified during scoping included effects on:

- Community access by air travel using the Jackson Hole Airport and other airports in the region;
- Levels of scheduled passenger service at the Jackson Hole Airport and other airports in the region;
- Levels of general aviation use at the Jackson Hole Airport and other airports in the region;
- Highway use and traffic in the area.;
- Public or commercial transit in the area; and
- Transportation planning.

Analysis

Community Access by Air Travel

Summer Visitors. During the summer, the number of visitors to Grand Teton National Park who arrive by air is estimated to be 6% (RRC Associates 2005) to 12% (Littlejohn 1998). These visitors usually arrive by scheduled passenger service rather than general aviation. Many of these visitors rent automobiles, while others join bus or van tours. Grand Teton National Park often is one of multiple destinations, which typically also include Yellowstone National Park and the town of Jackson.

For these summer visitors, the availability of flights to the Jackson Hole Airport is a convenience. Many tour operators provide similar services from Idaho Falls, Bozeman, and even Salt Lake City. Rental cars also are readily available in all of these cities.

The elimination of scheduled passenger service by the start of the general aviation period would increase drive times to get from the arrival airport to Grand Teton National Park and other summer attractions around the Jackson area. However, it probably would have minimal effect on visitors' choice of destinations or mode of travel. For summer visitors who arrive by air, Alternative 1 during the general aviation period would have direct, long-term, adverse effects of minor intensity. The effects on summer visitors who arrive in the area by other transportation modes would be negligible.

Closure of the Jackson Hole Airport in the year 2033 would have little additional effect on transportation of summer visitors. Only a very small percentage of summer visitors would be arriving in the area by general aviation. Also by then, alternate patterns of accessing the area in the summer would have been established. Closure of the airport would have a direct, long-term, adverse effect of minor intensity.

Winter Visitors. Surveys show that 90% of winter visitors to the area arrive by air (RRC Associates 2005). The primary destinations of most of these people are the area's winter recreation resorts or the town of Jackson.

After scheduled passenger services ended by the start of the general aviation period:

- Many winter visitors may choose to travel from other airports to the Jackson area by other modes, such as commercial van, bus, or limousine service, rather than renting vehicles and driving themselves. This would have the secondary effect of changing the transportation mode they use at their destination, such as relying on public transit rather than personal rental vehicles.
- Some may use general aviation, such as air charter services, to continue to access the area through the Jackson Hole Airport. This may particularly occur if the growing use of micro-jets reduces the cost of chartered jet service.
- Some may decide to travel to other destinations, such as ski resorts in California, Colorado, Utah, or even New England or Europe, rather than visiting Jackson.

The loss of direct air service to the Jackson area using scheduled passenger service would be regionally apparent. It would have a major, long-term, adverse, direct impact on winter visitors.

Indirect effects, including the reduced use of personal rental automobiles and the increased use of air charter service by winter visitors, would be long-term, and their intensity probably would be moderate to major. Their perception as adverse or beneficial would depend on consistency with transportation goals (such as those encouraging the increased use of mass transit) and other considerations, such as personal convenience.

Closure of the Jackson Hole Airport in the year 2033 would eliminate all general aviation flights into and from the airport. The effects would be apparent regionally, particularly if an extensive market for air charter service flying into the Jackson Hole Airport developed in the absence of scheduled passenger service. The resulting long-term, direct, adverse effect of airport closure on transportation for winter visitors to the area would be major.

Residents. Based on passenger levels that occur during the off-season months of April, May, and November, about 6,000 enplanements per month at the Jackson Hole Airport consist of area residents and individuals conducting non-seasonal business in the area. This represents nearly a third of the Teton County population of about 19,000 people and demonstrates that the airport provides an important, popular link to metropolitan areas nationwide.

During the general aviation period, area residents would have to drive to another airport to use scheduled passenger air service.

- Currently, the closest airport that provides this type of service is the Idaho Falls Regional Airport, which has 10 flights a day to Boise, Denver, Minneapolis, and Salt Lake City, plus three flights a week to Las Vegas. Under good driving conditions, the 90-mile drive to this airport from the Jackson town square takes about 2.5 hours. Drive times can be considerably longer during snowy or icy conditions.
- Salt Lake City International Airport is 305 miles and 6 hours distant from the Jackson town square under good driving conditions. This airport is served by 14 national and regional airlines and provides about 425 departures (850 operations) per day of scheduled passenger service.

During the general aviation period some area residents and business representatives may use general aviation, such as air charter services, to continue to use the Jackson Hole Airport. This may particularly occur if costs decline with the increased use of micro-jets.

The loss of scheduled passenger service from the Jackson Hole Airport during the general aviation period would result in a regionally apparent change in transportation among residents of Jackson and Teton County. The location from which they obtained this service would change, and they would have to travel much farther by automobile (90 or 305 miles, versus 9 miles to the Jackson Hole Airport) to get to an airport that currently provides scheduled passenger service. While the impact may be somewhat mitigated by the continued availability of air service by general aviation, the intensity of this long-term, direct, adverse effect on area residents would be major.

Closure of the Jackson Hole Airport in the year 2033 would eliminate general aviation flights at the airport. The effects would be apparent regionally, particularly if, as discussed for winter visitors, an increased market for air charter service developed in the absence of scheduled passenger service. The resulting long-term, direct, adverse effect on transportation for area residents would be major.

Levels of Scheduled Passenger Air Service

Jackson Hole Airport. By the start of the general aviation period, all scheduled passenger service to the Jackson Hole Airport would end. This would result in a major, direct, long-term, adverse effect. Closure of the airport in 2033 would have no additional effect on scheduled passenger service at this facility.

Idaho Falls Regional Airport. The airport most likely to be affected by the end of scheduled passenger service at the Jackson Hole Airport would be the Idaho Falls Regional Airport, which is a 90-mile drive from the town square in Jackson.

- This airport has two runways with lengths of 9,000 feet and 4,730 feet (compared to one runway at the Jackson Hole Airport with a length of 6,300 feet). The weight-bearing capacity of the longer runway at Idaho Falls is generally similar to that of the Jackson Hole Airport, although it has a greater rating for single-wheel configurations and a lower rating for double-tandem-wheel configurations (AirNav, LLC 2006). Both airports have instrument landing procedures.
- The Idaho Falls airport already provides scheduled passenger services, including 10 flights a day to Boise, Denver, Minneapolis, and Salt Lake City, plus three flights a week to Las Vegas.
- All of the daily flights are on relatively small, commuter-type aircraft, including the Bombardier Canadair CRJ-700 (70 seats), and De Havilland Canada DH8 (37 seats). The thrice-weekly Las Vegas flights are on the larger (172-seat) MD-83.

Starting with the transition period and continuing after 2033, a substantial volume of the scheduled passenger traffic that formerly used the Jackson Hole Airport probably would transfer to the Idaho Falls Regional Airport.

- During the summer, most of the visitors and Jackson area residents who currently fly into and out of the Jackson Hole Airport using scheduled passenger service would likely continue to access the area by air using the Idaho Falls Regional Airport.
- There may be reduced winter visitation to the Jackson region. The Idaho Falls Regional Airport could experience a substantial increase in scheduled passenger service during the winter. This traffic would include residents of the Jackson area and those visitors who continued to access Jackson and the winter recreation facilities in western Wyoming.

The long-term, indirect effect on the Idaho Falls Regional Airport would have major intensity and could be perceived either as beneficial or adverse.

- The number of enplanements from the Idaho Falls Regional Airport could increase three-fold compared to the current number.
- The airlines probably would change the type of aircraft they use at this airport from smaller, regional carrier planes to larger models, such as the Airbus A319 (124 seats) and Boeing 737 and 757 (124 and 188 seats, respectively) that currently are or recently have been used at the Jackson Hole Airport.
- The airlines probably would add flights to more cities.
- Additional airlines may enter the Idaho Falls market.

Salt Lake City and More Distant Airports. Beginning with the transition period and continuing after 2033, some of the passengers who formerly accessed the area via the Jackson Hole Airport may instead use the Salt Lake City International Airport or other regional airports. During the summer, the intensity of the indirect, long-term, beneficial effect at the Salt Lake City International Airport would be negligible to minor. During the winter when lower numbers of visitors could choose this approach, the intensity would be negligible.

Levels of General Aviation

Jackson Hole Airport. By the start of the general aviation period, all scheduled passenger service to the Jackson Hole Airport would be terminated. Because the presence of scheduled passenger service does not currently constrain general aviation at this facility, the direct effect of this action on general aviation would be negligible.

Substantial growth would be likely in the air charter segment of general aviation at the Jackson Hole Airport, as this segment expanded to meet travel demand in the area. This may particularly occur if the use of micro-jets or other technology reduces the cost of chartered jet service. This growth would begin during the transition period and continue until the airport closed in 2033. This growth would have a direct, major, long-term, beneficial effect on general aviation.

The absence of Federal Aviation Administration funding would challenge the ability of the Jackson Hole Airport Board to make substantial repairs, such as refurbishing the runway or taxiway. However, the Jackson Hole Airport Board probably could keep these facilities patched sufficiently to allow their use by most general aviation aircraft, particularly smaller models, until 2033. During the latter part of the general aviation period, pilots of some aircraft, particularly large planes, might avoid the facility because of concerns about safety or security, or because of difficulty in securing insurance. This would result in an adverse, long-term, direct effect of minor to moderate intensity on general aviation.

Closure of the airport in 2033 would end all general aviation at the Jackson Hole Airport. This would produce a major, direct, long-term, adverse effect on general aviation.

Alternate Airports. During the initial part of the general aviation period, the effect on general aviation at other airports in the region would be negligible. Over time, the deterioration of the runway and other facilities at the Jackson Hole Airport could prompt some pilots, particularly those of large planes, to use alternate airports. During this time, the long-term, beneficial, indirect impacts on general aviation at the Idaho Falls Regional Airport would be minor. The intensity of the impact at Salt Lake City and more distant airports would be negligible.

Closure of the Jackson Hole Airport in 2033 would require that all general aviation use be relocated to other facilities.

- Larger planes primarily would used well-established airports such as those in Idaho Falls and Driggs. Smaller general aviation aircraft could use these facilities, plus any of the small public airports and private airstrips in the region. General aviation at all of these sites would experience major, indirect, long-term, beneficial effects. At the larger facilities, the effect would result primarily from increases in itinerant general aviation, while at smaller facilities the effect probably would be associated with increases in local general aviation.
- After the air charter service that had developed at the Jackson Hole Airport ended, passengers who valued its convenience may continue to use air charter services to/from an alternate airport in the region. However, because most former passengers probably would start using scheduled passenger service at the Idaho Falls airport, the beneficial, long-term, indirect effects on the air charter component of general aviation that flew out of alternate airports would be of minor intensity.
- The intensity of the impact on general aviation at the Salt Lake City International Airport and more distant airports would be negligible.

Highway Use and Traffic

Scheduled-service passengers traveling to or from the Jackson Hole Airport generate about 870 daily vehicle trips during the peak summer month of July. Travel to or from the airport by scheduled-service passengers during the peak winter month of March produces about 730 daily vehicle trips. On-airport employment results in about 700 vehicle trips per day on an all-year basis. In addition, there currently are about 70 vehicle trips per day that are associated with general aviation (one per takeoff or landing operation).

Effects on U.S. Highway 26/89/191. The loss of scheduled passenger service by the start of the general aviation period would eliminate all of the vehicle trips associated with passengers and about 90% of the employee trips on U.S. Highway 26/89/191 between the airport and Jackson. During the peak summer month, this change would represent a 17% reduction in use on U.S. Highway 26/89/191. The relative change would be greater during the peak winter month, when the average daily traffic volume on this road would be reduced by more than 65%.

These changes in traffic counts would be readily apparent compared to historical norms. However, the effects may not be obvious to many drivers for the following reasons.

- Particularly during the summer, traffic on U.S. Highway 26/89/191 between Jackson and the airport road can be more strongly affected by the presence of a large animal close to the road than by traffic volume. Visitors who slow down or stop (sometimes in the middle of the road) to observe nearby moose, elk, or bison can cause traffic jams or slow-downs, regardless of the time of day or prevailing traffic levels.
- During the winter, the highway has substantial excess capacity. Traffic reductions associated with ending scheduled passenger service at the airport would not produce a change in the existing, very high level of service, and the availability of additional excess capacity would not be important to highway users.

The change would be limited to the southern part of the park and area around Jackson. Based on this limited geographic area and the two factors listed above, the intensity of the long-term, direct, beneficial effect on highway use and traffic on U.S. Highway 26/89/191 between the airport road and Jackson would be moderate.

Closure of the airport in the year 2033 would eliminate all airport-related traffic on U.S. Highway 26/89/191 north of Jackson. This would include highway traffic associated with current general aviation use and onsite employment to support that use (total of about 120 vehicle trips per day), *plus* highway traffic that had developed in association with the growth of the air charter segment of general aviation at the site. The perception of effects of the change would be affected by the same factors described above for scheduled passenger service.

- Summer traffic levels against which this change would be compared probably would be similar to or slightly higher than the summer traffic levels that occurred in the year 2005. The decrease in traffic counts, while detectable, would not be readily apparent and would result in a minor, long-term, direct, beneficial effect on highway use and traffic on U.S. Highway 26/89/191.
- Winter traffic levels would be well below those recorded in 2005, because of the previous loss of traffic associated with scheduled passenger service. Average traffic volumes in 2033 may total around 1,000 vehicles per day. Compared to this volume, the long-term, direct, beneficial effect on highway use and traffic on U.S. Highway 26/89/191 would be readily apparent and of moderate intensity.

Effects on Roads between Jackson and Idaho Falls. Demand for scheduled passenger service from the area formerly served by the Jackson Hole Airport could be met by airlines flying from the existing Idaho Falls Regional Airport. To drive between these communities:

- Drivers can travel between Jackson and Idaho Falls entirely on U.S. Highway 26.
- An alternate route involves traveling northwest on Wyoming Highway 22, which turns into Idaho Highway 33 at the state line; turning southwest on Idaho Highway 31 at Victor; and intersecting westbound U.S. Highway 26 at Swan Valley.

The former route is almost 20 miles longer, but the latter route crosses the 8,429-foot-high Teton Pass.

It was observed by the Idaho Transportation Department district engineer that "most" drivers select the shorter route (Cole 2006). Therefore, this impact analysis considered two situations, the first with all traffic using the shorter, steeper route, and the second with airport traffic split equally between the two routes. Trips by Idaho Falls airport employees were not included, because it was assumed that most airport workers would live in the Idaho Falls area.

If all airline passenger traffic took the Teton Pass route, on Wyoming Highway 22 close to Jackson, automobile trips by airline passengers would increase average daily traffic counts by 5.0% in the summer and 4.7% in the winter. Based on information from the Wyoming Department of Transportation (Thomas 2006), this already is the busiest two-lane highway in the state, with an average daily traffic count that is three times the threshold identified for maintaining an acceptable level of service rating of "C." In both summer and winter, the additional traffic associated with airline passengers would be detectable. More importantly, it would contribute to an already unacceptable level of service for this stretch of highway.

On the highway stretch over Teton Pass to Victor, Idaho, trips by airline passengers would increase the average daily traffic counts by 21.2% in the summer and 17.8% in the winter.

- Thomas (2006) stated that traffic on this stretch routinely exceeds the highway's capacity during the period from June through September, and indicated that traffic flow failed frequently. In the summer, the 21% increase in traffic produced by airline passengers traveling between Jackson and Victor would be readily apparent and would increase the already high number of traffic-flow failures.
- Traffic is lighter during winter, but highway conditions can be much more challenging. They often include icy roads and poor visibility, particularly during the dark hours when passengers on afternoon-arriving or early-morning-departing flights would be on the roads. Under these conditions, one slow-moving, inexperienced driver can cause major delays and long backups of traffic. This condition probably would be relatively common among the 730 daily vehicle trips by airport passengers that would occur during the peak ski season month.

At Victor, the traffic would turn southwest on Idaho Highway 31. On this highway, airport-related traffic would increase the traffic volume by 48.3% in the summer and 40.6% in the winter, compared to current average daily counts. The 21-mile-long Idaho Highway 31 from Victor to Swan Valley is described by the district highway engineer as "very winding and narrow" (Cole 2006). During the winter, it would be subject to delays caused by inexperienced drivers similar to those occurring on the Teton Pass road, particularly during inclement weather. These effects would be evident on this road to a distance of 45 miles from Jackson. As a result, highway use and traffic on this route would experience long-term, adverse, indirect impacts, and the intensity would be major.

If airline-passenger-related traffic split itself equally between the two routes, changes on the shorter, Teton Pass route would include the following.

- West of Jackson, traffic would increase by 2.0% to 2.5%, adding to already overloaded road conditions on this busiest two-lane highway in the state.
- Traffic on the road over Teton Pass would increase by 9% to 10%, exacerbating already overloaded (Thomas 2006) summer conditions and causing major delays in the winter from up to 365 additional drivers per day, many of whom probably would be uncomfortable driving on unfamiliar roads, particularly in the dark or during inclement weather.
- Between Victor and Swan Valley, traffic would increase by about 24% in the summer and 20% in the winter. During the winter, it would be subject to the same types of delays caused by inexperienced drivers that would occur on the Teton Pass road.

The magnitudes of these impacts would be somewhat less than those that would occur if all airline passengers chose the Teton Pass route. None-the-less, the intensity of the long-term, adverse, indirect impacts on highway use and traffic on this route would be major.

Traffic that traveled between Jackson and Swan Valley on U.S. Highway 26 would increase the peak summer month volume compared to average daily counts by 25.0% at Alpine Junction, Wyoming; by 27.2% at Palisades, Idaho; and by 18.9% at Swan Valley. The peak winter month increases compared to average daily counts would be 21.0% at Alpine Junction, Wyoming; 22.8% at Palisades, Idaho; and 15.9% at Swan Valley.

At Swan Valley, all airport-related traffic from the shorter Teton Pass route and the longer U.S. Highway 26 route would be combined for the drive into Idaho Falls. This would cause increases compared to current average daily counts of 24.9% in the summer and 20.9% in the winter.

The highway engineers for the states of Wyoming and Idaho both indicated that capacity currently was not a problem on U.S. Highway 26 and that there were ample passing opportunities to accommodate slower traffic (Cole 2006; Thomas 2006). Therefore, the level of service on this highway would remain in the acceptable range, despite the addition of airport-related traffic. However, because traffic volume increases of more than 20% would be readily apparent at the Idaho Falls city limit more than 80 miles from Jackson, the intensity of the indirect, adverse, long-term impact would be major.

Closure of the Jackson Hole Airport in 2033 would have little additional effect on highway use and traffic along the roads between Jackson and Idaho Falls for the following reasons:

- Some general aviation pilots and their passengers who wanted to visit Jackson would fly into the Idaho Falls airport and travel the roads between the two communities by automobile. However, the number of individuals would be small compared to existing highway traffic and may not be detectable compared to variations in normal traffic levels.
- Some general aviation pilots may fly into other public general aviation airports or private airstrips in the region and travel different roads by automobile to Jackson.
- Because of the inconvenience of not having a nearby airport, some general aviation pilots or their passengers may choose to visit other communities rather than Jackson.

As a result, the additional effect of airport closure on highway use and traffic would be indirect, adverse, and long-term, but the intensity would be negligible.

Public or Commercial Transit

By the beginning of the general aviation period, visitors who accessed the Jackson area by scheduled passenger airline service would have to arrive through another airport, such as the Idaho Falls Regional Airport. Particularly during the summer, many of these visitors would continue to rent automobiles in their arrival city and drive themselves around the area throughout their stay. However, during the winter, some visitors who were unfamiliar with winter driving could choose to use commercial or public transit for all or part of their ground travel. Common options could include traveling to Jackson by taxi, van, or bus service, and then either renting a car or using bus and taxi services for local travel.

Most visitors appreciate the convenience of personal automobiles. Therefore, many would continue to rent automobiles in their arrival city, despite concerns they might have about the 90-mile-long drive on potentially icy mountain roads. Visitors who were truly concerned about winter driving might choose another winter vacation destination. As a result, although beneficial increases in the use of public or commercial transit modes would occur during the winter season, the intensity of this direct, long-term impact would be minor. Changes in the summer probably would be negligible.

Closure of the Jackson Hole Airport in 2033 would have a negligible additional impact on the use of public or commercial transit. Relatively small numbers of visitors would be entering the area by general aviation, and this group would probably be disinclined to use public transit modes or most commercial services (although some may prefer taxis over rental vehicles).

Transportation Planning

Highway Planning. The Wyoming Department of Transportation and Idaho Transportation Department are not planning for substantial traffic increases or associated highway upgrades for the roads between Jackson and other airports, such as the Idaho Falls Regional Airport in Idaho. However, major highway improvements may be necessary if traffic volumes between Jackson and this community increased by 20% or more following an end of scheduled passenger service at the Jackson Hole Airport. (See the estimates under the heading "Highway Use and Traffic.")

Based on the cost data described previously from Cole (2006) and Thomas (2006), the cost for upgrading the existing, two-lane state highways to four-lane configurations along the Teton Pass route from Jackson to Swan Valley would be about $280 million. This would include about $105 million in Wyoming and about $175 million in Idaho. These costs do not include any highway improvements on U.S. Highway 26 between Jackson and Idaho Falls. They also do not include any right-of-way acquisition costs which would be very high for private property close to Jackson.

In comparison to these estimates, the fiscal year 2006 Statewide Transportation Improvement Program funding for *all* highway projects in the:

- State of Wyoming is $272 million (Wyoming Department of Transportation 2006).
- State of Idaho is $363 million (Idaho Transportation Department 2006).

Based on this funding, upgrading Wyoming Highway 22, Idaho Highway 33, and Idaho Highway 31 between Jackson and Idaho Falls would require more than 44% of the *combined* annual Statewide Transportation Improvement Program highway money for the states of Wyoming and Idaho.

It is more likely that both states would implement selective improvements, such as installing passing lanes and modifying curves. However, even if those improvements cost 10% of the upgrade costs cited above, they would still represent significant portions of the annual highway improvement funding for the states of Wyoming and Idaho. Because improvements of this magnitude would be planned, designed, and implements over a number of years, Alternative 1 would have a major, adverse, long-term, indirect affect on transportation planning for these two states.

Closure of the Jackson Hole Airport in 2033 would have little additional effect on highway planning for the region. As described previously, the volume of automobile traffic associated with general aviation is so low that changes associated with closing the airport probably could not be detected from normal variation. Moreover, the planning performed previously to accommodate traffic associated with airline passengers also would have considered the contribution from the future loss of general aviation. As a result, the additional impact resulting from airport closure in 2033 would be negligible.

Transit Planning. In the transportation plan that recently was completed for Grand Teton National Park (NPS 2006b), the National Park Service committed to preparing a transit business study. The transit business study would analyze the feasibility and need for public transit in and around Grand Teton National Park.

If the transit study showed that a public transit system was feasible and needed, transit services could be provided to popular locations within Grand Teton National Park. Buses or shuttles could connect sites in the park to each other and to sites outside the park, such as stops in the ski areas and Jackson. Candidate sites in the park could include, but may not be limited to, the visitor centers, lodges, marinas, campgrounds, picnic areas, food services sites, trail heads, historic sites, and overlooks. The Jackson Hole Airport also could be evaluated as a transit stop.

Alternative 1 would affect area transit planning and implementation for the long term, beginning during the transition period. The loss of scheduled passenger service would effectively eliminate planning for a transit stop at the Jackson Hole Airport, and would relocate the current 500,000 person-trips per year to and from the airport that would have been candidates for public transit use. However, the improved transit that would result from the planning might encourage visitors who arrived through other airports to take a commercial bus or van service to the Jackson area, and then rely on public transit for their local travel. The effects of Alternative 1 on public transit in the area would be both beneficial and adverse, would be indirect and long-term, and would be of moderate intensity.

Cumulative Impacts

Cumulative impacts on community access by air travel, levels of scheduled passenger air service, and levels of general aviation use would be triggered by service decreases at, and the eventual closure of, the Jackson Hole Airport. None of the airports or private airstrips in the region currently have major expansion plans relating to demand for travel involving Jackson and Grand Teton National Park, because they expect that this demand will continue to be met by the Jackson Hole Airport. If that expectation changed because the airport would close under Alternative 1, the cumulative impacts would be closely tied to the indirect and indirect impacts that were discussed previously under "Analysis."

Because of the high capital and operational costs of constructing and maintaining roads, states and communities need to forecast travel demand accurately. The highway engineers for the states of Wyoming and Idaho (Cole 2006; Thomas 2006) identified only limited highway upgrades for the area over the next 20 years, based on expected future demand from conditions other than the potential for the Jackson Hole Airport to decrease service and then close. Cumulative effects on highway use and traffic, including planning changes, would be triggered by Alternative 1 and would be closely tied to the direct and indirect impacts that were discussed previously under "Analysis."

Air service decreases at, and the eventual closure of, the Jackson Hole Airport may make the Jackson and Teton County area less attractive for future development. This could reduce the rate of population growth and the associated growth of traffic, although many interdependent factors contribute to changes in population numbers and distribution.

Airport changes may also reduce the attractiveness of the area as a winter resort destination, which could reduce traffic by winter visitors and by the workers who provide services to those visitors. A cumulative effect would be that the current roads near Jackson could meet traffic demand for longer into the future, particularly during the winter. However, because the area's highway requirements are controlled more by summer visitation than by winter conditions, the intensity of this indirect effect would be negligible to minor.

Public or commercial transit, including planning, is an evolving area where changes may occur regardless of whether the 1983 agreement for the Jackson Hole Airport is extended. The change in established travel patterns that may occur in association with Alternative 1 may change opportunities to promote transit, and the long-term effects would be both adverse and beneficial.

Conclusions

The end of scheduled passenger service, followed by closure of the airport, would have direct, long-term, adverse effects of minor intensity on summer visitors who arrive by air. The impacts on other summer visitors would be negligible. For winter visitors, impacts would be major, long-term, and adverse, and the direct impacts would be moderate to major. Changes in community access by air travel would have major, direct, long-term, adverse effects on residents and the business community.

Impacts on levels of scheduled passenger air service at the Jackson Hole Airport would be major, direct, long-term, and adverse. Major, indirect, long-term, beneficial effects would occur at the Idaho Falls Regional Airport. The indirect, long-term, beneficial effects at airports in Salt Lake City and more distant locations would be negligible to minor.

Initially, impacts on levels of general aviation at the Jackson Hole Airport would be negligible, but minor to moderate, adverse, long-term, direct effects could develop during the general aviation period if airport facilities deteriorated and operators of large aircraft became concerned about safety or security.

Growth in the air charter sector would have an indirect, major, long-term, beneficial effect on general aviation at the Jackson Hole Airport. Closure of the airport in 2033 would produce a major, direct, long-term, adverse effect on all general aviation sectors at the Jackson Hole Airport.

At alternate airports, the long-term, indirect, beneficial effects of Alternative 1 on general aviation would be negligible to minor until 2033. Closure of the Jackson Hole Airport in that year would result in major, indirect, long-term, beneficial effects on general aviation at other airports in the region.

Highway use and traffic would decrease on U.S. Highway 26/89/191 between the airport and Jackson, producing a long-term, direct, beneficial effect of moderate intensity. Traffic increases on highways between Jackson and the Idaho Falls Regional Airport would increase by 5% to 40%, with most changes in the range of 20%. Many of these highways already have capacity problems, and the additional traffic resulting from Alternative 1 would have major, adverse, direct, long-term effects. Highway planning in Wyoming and Idaho to alleviate these adverse effects also would experience major, adverse, indirect, long-term effects.

During the winter, Alternative 1 would have direct, minor, long-term, beneficial effect on the use of public or commercial transit. The impact during the summer season would be negligible. Because it would change established travel patterns, this alternative could increase opportunities to promote transit, the effects of which would be moderate, indirect, long-term, and both beneficial and adverse.

ALTERNATIVE 2

Regulations and policies that apply to each impact topic and the methods that were used to evaluate each impact topic, including impact thresholds, are the same as those described for Alternative 1.

NATURAL SOUNDSCAPE

Analysis

Acoustic Metric That Determines Impact Designation

Figures 24 and 25 illustrate the modeled results for the percent of time aircraft using the Jackson Hole Airport would be audible at each of the modeled locations under Alternative 2 for the July-through-September peak season in 2015 and 2025. To determine the impacts of Alternative 2 compared to the no action alternative, these results were compared to the results shown in Figures 16 and 17.

The percent of time aircraft would be audible would increase from Alternative 1 conditions. The area of the park where aircraft would be audible more than 10% of the time would be 27% in both 2015 and 2025, compared to 19% and 20% in 2015 and 2025, respectively, for Alternative 1. The amount of the park where aircraft would be audible 25% or more of the time would be 10% in both 2015 and 2025, as opposed to 7% in both time periods for Alternative 1.

As noted previously, areas of the park for which percent of time aircraft are audible is relatively low also experience sound levels that are relatively low. Under Alternative 2 for the 2015 peak season:

- In areas of the park where aircraft would be audible less than 10% of the time, 83% of the modeled points would have a maximum sound level lower than 60 dBA, and 67% would have a maximum sound level lower than 50 dBA. For points where percent of time audible would be less than 10% but maximum sound level would be 60 dBA or greater, the average time above 60 dBA would be about one second per day. (These values are not comparable to the corresponding Alternative 1 values because they represent a smaller part of the park than in that alternative.)
- Conversely, areas of the park where aircraft percent of time audible would be relatively high also would experience higher sound levels. For the 2015 peak season, areas of the park where aircraft would be audible 20% or more of the time (64 points, or 13% of the park, compared to 9% of the park in Alternative 1), maximum sound levels would range from 47 to 106 dBA, with an average value of 70 dBA. Time above 60 dBA for these points would range from zero to 45 minutes per day (compared to a high of 34 minutes per day in Alternative 1), with an average of 3 minutes; 26 of the 64 points would have no time above 60 dBA.

Figure 18 includes the modeled results for aircraft percent of time audible values at locations in the park for Alternative 2 for the 2015 peak season and Figure 19 provides the corresponding information for 2025. The modeled results for Alternative 2 show that conditions in 2015 and 2025 would be higher than those occurring under Alternative 1, with the greatest increase, of about 4 percentage points, occurring in 2025 for percent-time audible of greater than 25%.

FIGURE 24: NUMBER OF POINTS IN GRAND TETON NATIONAL PARK BY PERCENT OF TIME AUDIBLE FOR 2015 PEAK SEASON UNDER ALTERNATIVE 2

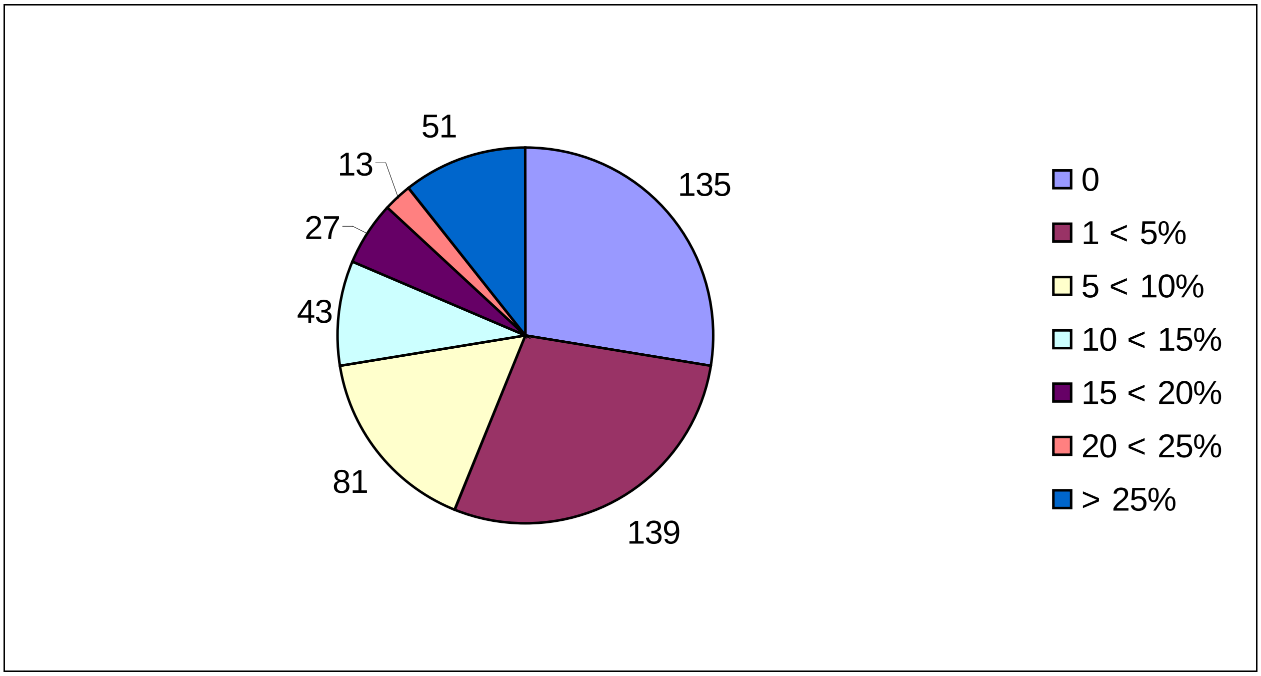
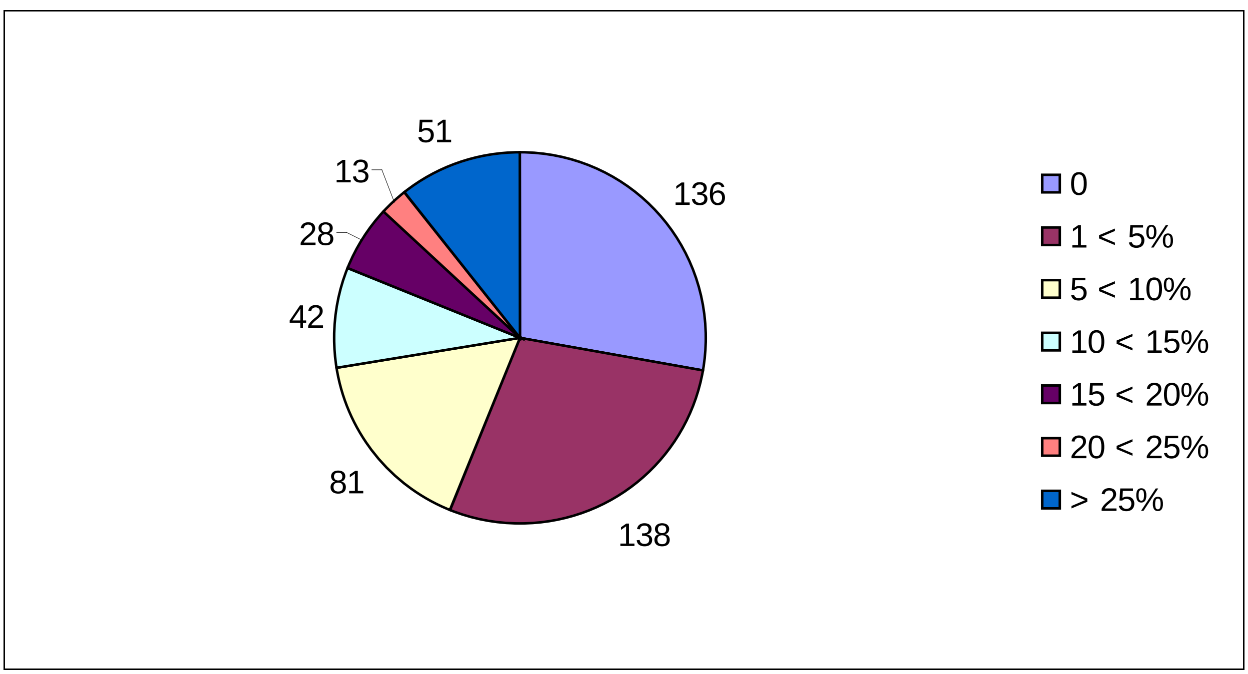


FIGURE 25: NUMBER OF POINTS IN GRAND TETON NATIONAL PARK BY PERCENT OF TIME AUDIBLE FOR 2025 PEAK SEASON UNDER ALTERNATIVE 2



The greatest difference would occur at locations close to the airport, where values for percent-time audible would increase relative to Alternative 1 conditions. By 2025, aircraft would be audible for more than 21 minutes each hour at 31 points, and would be audible for more than 30 minutes each hour at five points. With increasing distance from the airport and aircraft flight paths, the intensities of aircraft sound emissions would diminish to the point of being negligible in the north part of the park.

Additional Acoustic Metrics

Maximum Sound Levels in Grand Teton National Park. The modeled maximum sound levels (Lmax) for airport-related aircraft at locations in the park for Alternative 2 in 2015 and 2025 are shown in Figure 20. The maximum sound levels at any location depend on the proximity and type of aircraft in the fleet, and not on the number of operations carried out by those aircraft. Because the fleet mix and modeled flight routes do not change between 2015 and 2025, the predicted maximum sound levels for Alternative 2 in these years would be identical.

Because of changes in the types of aircraft predicted under Alternative 2, a larger percentage of the modeled points would have maximum sound levels in the range of 50 dBA to 70 dBA than under Alternative 1. (See Table 7 for a comparison of these levels to common sound sources.) However, the number of points exposed to maximum sound levels above 70 would be the same as in Alternative 1.

15-Hour Energy-Average Sound Level (Leq). Maps that show the Leq that would be associated with Alternative 2, based on a 15-hour day (7 A.M. to 10 P.M.), are provided in Appendix G. Figures G-23 and G-28 show 2015 patterns for all-year and peak-season conditions, respectively, and the corresponding patterns for 2025 are shown in Figures G-25 and G-30. All of these figures show the areas of the park (indicated with blue hatching) where the day-night average sound level associated with airport operations cannot exceed 55 dBA, and the 45-dBA line (shown in purple) specified in the 1983 agreement.

The 65 dBA Leq contour north of the runway would remain within the airport boundary. However, the 65 dBA contour south of the runway would extend beyond the Alternative 1 65 dBA contour. During the peak season in 2025, the additional area would be about a quarter-mile longer and an eighth-mile wider, compared to Alternative 1 conditions.

Time above 60 dBA. The modeled values for percent-time above 60 dBA at locations in the park for Alternative 2 in 2015 for the peak season, based on a 15-hour day (7 A.M. to 10 P.M.), are presented in Figure 21. Figure 22 has the corresponding 2025 results. Despite the changes described above for percent-time audible, there would be almost no change in percent of the time above 60 dBA compared to Alternative 1.

Effects of the Jackson Hole Airport on Natural Soundscapes in Recommended Wilderness

The recommended wilderness in Grand Teton National Park and its relationship to the Mountain Zone and modeling of impacts from airport-related sound were described in the Alternative 1 analysis. Among the 222 grid points in the recommended wilderness boundary, impacts of Alternative 2 would be slightly higher than those under Alternative 1. Differences would include the following.

- The maximum modeled sound level within the recommended wilderness area would range from 11 dBA in 2015 (9.4 dBA in 2025) to 62.2 dBA in both 2015 and 2025. This would be a small increase from the Alternative 1 values, which ranged from 8.2 dBA to 59.6 dBA in both 2015 and 2025.

- Three points had time above 60 dBA, compared to no points for Alternative 1. However, the time above 60 dBA was less than six seconds during the 15-hour day for each of the sites.
- Eight points (compared to four points in Alternative 1) were above 20% time audible. The maximum value was 37%, compared to a maximum of 29% for Alternative 1.
- Eleven points (compared to six points in Alternative 1) were above 15%, and 16 points (compared to 11 or 12 points in Alternative 1) were above 10% time audible.
- In 2015, 117 points (compared to 123 points in Alternative 1) and in 2025, 118 points (compared to 136 points in Alternative 1) had airport aircraft audibility of zero.
- As under Alternative 1 conditions, the acoustical effects from the airport aircraft would decrease as the distance from the airport and the flight routes increased.

Aircraft Sound on Lands Outside the Park

The 15-hour sound energy level (Leq) for areas outside the park, based on the period from 7 A.M. to 10 P.M., were discussed above in association with Appendix Figures G-23, G-25, G-28, and G-30. Other effects of Alternative 2, compared to Alternative 1, would be as follows:

- The maximum aircraft sound levels outside the park from airport use would not change from those in Alternative 1, either in 2015 or 2025.
- For the all-year period in 2015 and 2025, sound associated with Alternative 2 would be little changed from Alternative 1 for the percent of the points in the modeled area in which aircraft sounds were below 60 dBA, or exceeded 60 dBA for less than a minute during a day. The highest values for time above 60 dBA also would be similar, at about 21 minutes per day in 2015 and 22 minutes per day in 2025.
- July-through-September peak-season airport use in 2015 and 2025 would increase the area outside the park where airport-related sound was above 60 dBA. About 5% more of the modeled points than in Alternative 1 would experience sound levels 60 dBA or higher. Alternative 2 also would increase the highest values for time in 2015 above 60 dBA to 31 minutes per day. By 2025, the highest values would be 35 minutes per day, compared to 34 minutes per day for Alternative 1.

By 2025, the Federal Aviation Administration's criterion for significance potentially could be meet in an area immediately south of the airport boundary. Other areas under the flight path south of the airport that would experience increases in the Leq might meet one of marginal effects criteria of the Federal Aviation Administration that are shown in Table 1.

Cumulative Impacts

Cumulative impacts under Alternative 2 would be similar to those described for Alternative 1, and would be major, direct, long-term, and adverse. Because Alternative 2 would result in the continuation of scheduled passenger service, the air traffic control tower would likely remain in operation, and could help prevent aircraft engaged in activities such as scenic or sightseeing flights from inappropriately over-flying the park at low altitudes.

Conclusions

The effects of Alternative 2 on the natural soundscapes of Grand Teton National Park would be major, direct, long-term, and adverse. In both 2015 and 2025, aircraft using the Jackson Hole Airport would be audible more than 10% of the time over approximately 27% of the park. The effects would be most evident within a few miles of the airport, and would affect predominantly areas in the south part of the park. With increasing distance from the airport and aircraft flight paths, aircraft sounds would diminish to the point of being negligible impacts.

More points in the park would experience maximum sound levels in the range of 50 dBA to 70 dBA than under Alternative 1. The number of points exposed to maximum sound levels above 70 would not change from the number in Alternative 1.

The 15-hour energy-average sound level (Leq) which, because of the curfew, effectively represents the day-night average sound level (DNL), would extend slightly beyond the Alternative 1 contours. However, the DNL would remain within the requirements stipulated in the 1983 agreement.

Compared to Alternative 1, there would be little change in 2015 or 2025 regarding the percent of the time above 60 dBA at locations in the park. At points in the recommended wilderness boundary, impacts of Alternative 2 would be slightly higher than those under Alternative 1.

Outside the park, the Federal Aviation Administration's criterion for significance potentially could be meet in an area immediately south of the airport boundary by 2025. Other areas under the flight path south of the airport might meet this agency's marginal effects criteria.

The 1983 agreement established an upper bound on the amount of noise exposure that would be allowed as a result of the operation of the airport, and would not result in a significant impact on the park. Since 1983, the Jackson Hole Airport Board has operated the airport in compliance with the terms and conditions of the agreement, and the noise impacts on the park have remained below the levels authorized in the agreement.

In preparing this environmental impact statement 27 years after the 1983 environmental assessment, the National Park Service used an array of metrics to assess the noise effects on the park, and reevaluated what constitutes a significant, or major, impact with respect to the requirements of the National Environmental Policy Act. The process of measuring the noise impacts with multiple metrics does not alter the magnitude of the impacts, but facilitates understanding the impacts in different ways. Similarly, characterizing the noise impacts as major, or significant, reflects an evolution in the NPS' policies and procedures under the National Environmental Policy Act, and the scientific understanding of natural soundscapes, but does not mean that the impacts are any greater than what was described when the agreement was signed in 1983. As described in this environmental impact statement, the noise impacts associated with operation of the airport have remained below the limits established in the agreement, and the terms of the agreement provide an enforceable mechanism for ensuring that the impacts will not exceed those limits.

The conclusion that the impacts of Alternative 2 on the natural soundscape of the park would be major and adverse is based on the evaluation of airport-related sound against a baseline of the park's natural soundscape, rather than as a change from current condition. As is noted elsewhere in this final environmental impact statement, the natural soundscape of the park is affected by many sources of non-natural sounds, such as the sounds of motor vehicles along, and in some cases long distances from, road corridors and developed areas. Thus, although the baseline for the analysis of the effects of the airport on the natural soundscapes of the park is a truly natural condition throughout the entire park for the entire day, such a condition does not actually exist. Rather, the analysis allows a comparison against an idealized condition.

The impact determination in this section is based on the *absolute* amount of the park affected by aircraft audibility of 10% or more, rather than the *change* in the amount of the park affected by that level of audibility. Therefore, since 27% of the park would have aircraft audibility of 10% or greater in 2025, the impact level is categorized as major and adverse. With respect to the change from Alternative 1 conditions, the area of the park affected by aircraft audibility of 10% or greater would increase from 20% to 27% in 2025.

The effects of Alternative 2 described in this section are premised on a continuation of the existing noise abatement and mitigation measures required of the Jackson Hole Airport Board in the 1983 agreement, including the noise abatement plan. Adoption of additional mitigation measures, such as those described in Chapter 2, would be expected to further reduce the effects of the airport on the natural soundscapes of the park. In addition, further improvements in aircraft technology, such as quieter engines, could also reduce impacts on the park.

Chapter 1 describes the NPS' statutory requirements under the Organic Act to protect park resources from actions that would result in impairment. Selection of Alternative 2 would not result in impairment of the natural soundscapes of the park for the following reasons.

- The Jackson Hole Airport has operated in its present location since the 1930s, which was prior to the establishment of either Jackson Hole National Monument or the present-day Grand Teton National Park. When Congress established the park in 1950, it knowingly included the airport within the boundaries, creating a unique situation. The enabling statute for the park also provided that existing leases, permits, and licenses would continue. Over the years since the park was established, the airport and park have evolved together, under a series of special use permits and the current 1983 agreement.
- Earlier in 1950, the year of the park's establishment, Congress enacted the Department of the Interior Airports Act, authorizing the Secretary of the Interior to establish, regulate, and maintain airports within national parks when determined to be necessary, as was done in the 1983 agreement. That determination and other aspects of the 1983 agreement were challenged and upheld in a 1985 decision by the U.S. District Court for the District of Wyoming (*Sierra Club v. Watt*, Case No. C83-0406-B (D. Wyo. 1985)).
- The airport thus represents a unique activity, which has existed since before the park's creation and has specific legislative authorization, and its impacts must be understood in that context. While that in and of itself does not excuse the impacts of the airport, or entirely exempt them from the requirements of the Organic Act, it is not a new use that introduces changes to the park that have not been previously present. Because the soundscapes in the park have from the beginning been affected by the airport, the airport's soundscape impacts cannot be said to harm the specific purposes of the park or its integrity in the way that similar soundscape impacts might in another park. In the context of Grand Teton National Park, the airport's soundscape impacts are not the sort of impacts that are considered more likely to cause impairment.
- The analysis of the effects of Alternative 2 on the natural soundscapes of the park show that the amount of the park affected by aircraft audibility of 10% or more would increase from 24% of the park to 27% of the park, and that the 15-hour Leq contours would remain within the limits required by the agreement. (As discussed elsewhere, the 15-hour Leq is not precisely the same as a true day-night average sound level (DNL), but it is a very close proxy in this case.). Furthermore, these values are based on a continuation of existing operations and do not take into con-

sideration any of the potential mitigation options identified in Chapter 2. Implementation of any of those actions could further reduce the effects of the airport below the levels presented in the analysis. In any event, the agreement requires that the Board must operate the airport in a manner that does not violate the noise requirements.

- Most of the park would be substantially unaffected by aircraft sounds, which would occur infrequently and at low sound levels. In 2015 and 2025 during the peak season, aircraft would be audible less than 10% of the time over approximately 73% of the park, and less than 5% of the time over 56% of the park. Impacts would be lower during most of the year when there were fewer aircraft using the Jackson Hole Airport (see Figure 7). The number of aircraft operations during the winter peak season is approximately half the summer peak, and spring and fall operations are lower than during either peak.

- In most areas of the park where aircraft would be audible, the sound levels would be relatively low. In 2015 and 2025, for the 73% of the park where aircraft sounds would be audible less than 10% of the time, 83% of the modeled points would have a maximum sound level lower than 60 dBA, and 67% would have a maximum sound level lower than 50 dBA. For those points where percent-time audible is modeled to be less than 10%, but maximum sound level is above 60 dBA, the average time above 60 dBA would be about one second per day in both 2015 and 2025. A combination of factors, including the airport's location adjacent to the park boundary at the southern end of the park, the fact that aircraft are at progressively higher altitudes with distance from the airport, and the use of the airspace almost entirely for direct travel to and from the airport, result in the effects of Alternative 2 being most pronounced close to the airport and diminishing rapidly with distance from it.

- The effects of the airport are most pronounced in areas of the park where, for most visitors, their experience is characterized by motor vehicle travel on park roads or the highway, or activities within developed areas. In many park locations where effects of the airport are greatest, ambient sound levels, which mask the sound of aircraft to some degree, tend to be higher than the values used in the modeling. In these areas, the addition of airport-related sounds is small in comparison to other natural or non-natural sounds that are ubiquitous, including those of motor vehicles.

- Areas of the park in which natural sounds predominate, such as the recommended wilderness, are only slightly affected by the presence of the airport. As shown in the analysis, much of that area is entirely unaffected, and the remaining portions are affected by low sound levels on an infrequent basis.

- The effects of the airport on the natural soundscapes of the park are constrained by the terms of the 1983 Agreement, which establishes specific upper bounds on aircraft noise that may not be exceeded. The cumulative noise requirements as expressed in the limitations on the size and configuration of the contours for a day-night average sound level (DNL) of 45 and 55 dBA, as well as the single event noise limits, represent an upper bound on noise exposure. Furthermore, the airport's noise abatement plan includes enforceable mechanisms, such as the limits on average daily departures, which ensure that park resources and values are adequately protected from noise exposure.

Although a large area of the park would be affected to some degree, the magnitude of those effects at any given point would be small over most of the park, particularly those portions of the park that are key to its enjoyment by park visitors. Thus, the adverse impacts, while major in intensity based on the impact thresholds, would not rise to the level of impairment.

VISITOR USE AND EXPERIENCE

Analysis

Under Alternative 2, visitors would continue to have the same range of opportunities to enjoy Grand Teton National Park that would be available under Alternative 1. The factors contributing to high levels of visitor satisfaction cited under Alternative 1 would not change under Alternative 2, including outstanding opportunities for scenic and wildlife viewing and recreation, the number and type of activities available, the condition of park facilities and roads, and the positive interactions with park staff and other visitors.

The Jackson Hole Airport would continue to accommodate both scheduled passenger service and general aviation. The modest growth in the number of operations would largely be the result of a trend by the airlines to replace smaller aircraft with fewer seats with larger aircraft capable of carrying more passengers per flight, which enables them to transport more passengers without substantially increasing the number of flights.

As described under Alternative 1, the presence or absence of natural and non-natural sounds would continue to influence visitor use and experience in the Mountain Zone, Valley Zone, and Through Zone (which are shown on Figure 8). Each would continue to offer different visitor experiences, and visitors in each zone would continue to have different expectations and degrees of awareness regarding the natural soundscape and non-natural sounds.

Under Alternative 2, the impacts of the airport on the natural soundscapes of the park would continue to be greatest in areas where most visitors would have lower expectations for natural sounds, because of the presence of developed areas, roads, and park visitor facilities. As in Alternative 1, the degree of impacts on visitor experience from airport-related sounds would depend on the management zone, audibility of other sources of sounds, and expectation level regarding natural soundscapes.

Within each zone, particularly in the Mountain Zone and in areas in the north part of the park, some points would have airport-related aircraft audibility values of zero for both alternatives. At all of these points, Alternative 2 would have a negligible impact on visitor use and experience compared to Alternative 1 both in 2015 and 2025.

Table 42 compares the model outputs at popular locations (all shown in Figure 2) in each management zone for the two alternatives in 2025 for two key metrics, percent-time audible and time audible above 60 dBA. All of the locations in the table are in areas of the park where the percent-time audible value is greater than zero for both alternatives.

As shown in Table 42 for the 2025, Alternative 2 would result in increases in percent-time audible for airport-related sound at many locations in each management zone. The increases would be greatest in the southern part of the Through Zone, which is closest to the airport. However, because of the prevalence of other non-natural sounds and a lower expectation of experiencing natural soundscapes, differences in the percent-time audible for airport-related sound between the two alternatives may not be perceptible to visitors in this area. Thus, impacts on visitors in the Through Zone would be long-term, direct, adverse, and of negligible or minor intensity.

TABLE 42: 2025 PERCENT-TIME AUDIBLE AND TIME ABOVE 60 DBA VALUES IN ALTERNATIVE 1 AND ALTERNATIVE 2 FOR VISITOR ACTIVITY SITES [a/]

Site	Percent-Time Audible [b/]		Time above 60 dBA [b/] (total minutes per 15-hour day)	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Mountain Zone				
Phelps Lake	16.8	16.8	0.0	0.0
Bradley Lake and Taggart Lake [c/]	13.8	13.8	0.0	0.0
Mount Wister	10.0	14.2	0.0	0.0
Death Canyon Trail [c/]	1.5	3.1	0.0	0.0
South Teton Peak [c/]	1.1	1.1	0.0	0.0
Crest Trail	0.5	1.2	0.0	0.0
Valley and Through Zones				
Gros Ventre Campground	36.0	47.5	0.0	0.2
Murie Ranch	34.4	45.5	1.8	1.9
Moose Village [c/]	31.8	42.6	9.7	13.5
White Grass Ranch [c/]	27.8	37.0	0.0	0.0
Kelly	16.9	23.7	0.0	0.0
South Jenny Lake Junction	9.2	14.4	0.0	0.0
Signal Mountain [c/]	7.4	10.4	0.0	0.0
Signal Mountain Lodge	6.6	9.8	0.0	0.0
Jenny Lake Visitor Center	6.5	10.1	0.0	0.0
Jackson Lake Lodge	5.4	7.6	0.0	0.0
Cunningham Cabin	5.1	7.4	0.0	0.0
Emma Matilda Lake [c/]	3.5	5.1	0.0	0.0
Colter Bay Village [c/]	2.1	3.3	0.0	0.0

a/ All values are for the airport's peak season from July through September. This period generally corresponds with the park's maximum visitor use period.
b/ Airport operations were modeled based on a 15-hour day, from 7 A.M. to 10 P.M. This period corresponds with the typical period of visitor activity.
c/ For activity areas that included, or were between, two or more modeling points, the results from the point with the highest percent-time audible are presented here.

The Valley Zone includes a variety of destinations and experiences. Impacts on visitors in the Valley Zone primarily would depend on their location in the zone. In all cases, the Alternative 2 value in Table 42 is higher than the Alternative 1 value, sometimes substantially. For instance, the Jenny Lake Visitor Center has a predicted percent-time audible in 2025 of 10.1%, compared to 6.5% at this site in Alternative 1. Visitors to Valley Zone sites likely would have a higher expectation of experiencing natural sounds than in the Through Zone, but also would have an expectation of the presence of non-natural sounds inherent in developed areas of the park. Thus, impacts in the Valley Zone would be long-term, direct, adverse, and negligible to moderate in intensity.

Visitors to the Gros Ventre Campground in the Valley Zone would experience an increase in percent-time audible from 36.0% in Alternative 1 to 47.5% in Alternative 2. Some campers might experience sleep interruption (over 45 dBA) as described in the "Affected Environment" section. However, impacts to sleep at night would be mitigated by the airport curfew hours of 11:30 P.M. to 6:00 A.M.

and the fact that most airport operations occur between 7:00 A.M. and 10:00 P.M. (see Figure 6). Therefore, the incidence of sleep disturbance probably would be little changed from that which would occur with Alternative 1.

Visitors to the Laurance S. Rockefeller Preserve, which is in both the Mountain and Valley Zones (mostly in the Mountain Zone), would experience an increase in peak-season percent-time audible from 30% for Alternative 1 to 38% for Alternative 2 in 2025. These percentages correspond to aircraft sounds being heard for 18 minutes per hour and 23 minutes per hour, respectively. Visitors hiking the preserve trails to Phelps Lake would likely have a higher expectation for natural sounds as they traveled away from the Moose-Wilson Road and farther into the backcountry and, thus, may experience adverse impacts from airport-related sounds.

Interpretive talks given by park rangers at the Craig Thomas Discovery and Visitor Center, Laurance S. Rockefeller Preserve, Jenny Lake Visitor Center, and Colter Bay Visitor Center could experience the same types of interruptions based on sound levels above 52 dBA (U.S. Environmental Protection Agency 1974) that were described for Alternative 1. This could be particularly apparent at the Laurance S. Rockefeller Preserve, where maximum sound levels would rise from 45 dBA for Alternative 1 in 2025 to 62 dBA under Alternative 2. Because these interruptions would be more frequent than under Alternative 1, particularly during the peak season, they could produce minor, long-term, direct, adverse impacts compared to Alternative 1.

There may be long-term, direct, adverse, and minor to moderate impacts to some visitors at the Murie Ranch, located in the Valley Zone, compared to Alternative 1. This National Historic Landmark is located about a half-mile south of the Craig Thomas Discovery and Visitor Center. Some visitors to the Murie Ranch may feel that the increased percent of the time that aircraft are audible at this site (from 34% in the 2025 peak season under Alternative 1 to 46% in 2025, although there would be little change in time at levels that would interfere with speech) would increase their sense of incongruity with their expectations, especially in light of the significance of the site to the preservation of wilderness values.

Consultation with the Wyoming state historic preservation officer included analyzing potential airport-related sounds relative to the designation of the Murie Ranch as a national historic landmark. This analysis showed that aircraft audibility did not have an adverse effect on the characteristics for which the property was nominated. This finding received concurrence by the Wyoming state historic preservation officer (see Chapter 1 under “Impact Topics Dismissed from Further Consideration, Cultural Resources” and the correspondence in Appendix A).

As shown in Table 42, percent-time audible values in the 2025 peak season for Alternative 2 in the Mountain Zone, which largely corresponds to the park’s recommended wilderness, would be the same as or slightly higher than those predicted for Alternative 1. Maximum sound levels and time above 60 dBA (totaling up to six seconds during the 15-hour day for each of three points under Alternative 2) also would be slightly higher under the preferred alternative. Because this is the part of the park in which visitors likely would have the greatest sensitivity to non-natural sounds, the intensity of the direct, adverse, long-term impact on visitor experiences in this area could range from negligible to moderate.

Alternative 2 would continue impacts on visitor use and experience beyond 2033. However, without another extension of the 1983 agreement shortly after 2025, the airport would again have fewer than 20 years remaining on its agreement. This would result in the discontinuation of scheduled passenger service beginning in 2033. As a result, impacts of Alternative 2 beyond 2033 would be similar to those described for the general aviation period of Alternative 1.

Cumulative Impacts

Cumulative impacts would be the same as those described for Alternative 1.

Conclusions

Under Alternative 2, impacts on visitor use and experience would be long-term, direct, and adverse, and would range in intensity from negligible to moderate. The degree of impact would depend on individual visitor expectations as well as their location in the park relative to the airport.

AIR QUALITY

Analysis

The direct and indirect effects analysis for Alternative 2 was completed by comparing the impacts of Alternative 2 with the impacts of Alternative 1.

As shown in Table 35, emissions from implementing Alternative 2 would be higher for all air pollutants than those occurring with Alternative 1 in corresponding years. However, they would be lower in both 2015 and 2025 than emissions currently occurring under the modeled existing conditions baseline. Therefore, on a relative basis, impacts from Alternative 2 would be greater than those that would occur with Alternative 1, and less than the current condition. Details regarding impacts for each of the air quality factors of concern are provided below.

Effects on Emissions of Criteria Pollutants

Table 35 presented the emissions of criteria pollutants, in tons per year, that would be associated with all activities at the Jackson Hole Airport under Alternative 2 in 2015 and 2025. As shown in the table, emissions in both periods would be higher than those occurring in corresponding periods in Alternative 1, but would decrease relative to the emissions occurring during the modeled existing conditions baseline.

Compared to Alternative 1 in both 2015 and 2025, impacts of implementing this alternative would be direct, long-term, and adverse for all criteria pollutants. Based on the impact thresholds, the changes of less than 50 tons per year for sulfur dioxide and particulate matter would be negligible in intensity. Intensities would be minor for nitrogen oxides and carbon monoxide. There would be no discernable change to lead emissions compared to Alternative 1.

Under Alternative 2 after 2033, without another agreement extension that would require an analysis of impacts under the National Environmental Policy Act, it is likely that the airport would lose its Part 139 certification and scheduled passenger service aircraft operations would cease, with general aviation operations continuing until 2053. Thus, impacts after 2033 under Alternative 2 would be similar to those described for Alternative 1 in 2015.

Effects on Ability to Meet National Ambient Air Quality Standards

Compliance with the National Ambient Air Quality Standards is evaluated in Table 43. The values that were determined by calculating the maximum Jackson Hole Airport source impacts for each criteria pollutant and averaging period and summing them with the corresponding background concentration were compared to the standards in Table 34. They also were compared to the Alternative 1 values presented in Table 36. As shown in Table 43:

- For some pollutants and/or averaging periods, emissions would be slightly higher than the emissions occurring during the corresponding periods of Alternative 1 (for example, sulfur dioxide, 24-hour in 2015), or they would be the same as the Alternative 1 values (for example, sulfur dioxide, 3-hour in 2015). Modeled results for Alternative 2 never exceeded those from the modeled existing conditions baseline.
- Total predicted emissions plus background associated with Alternative 2 for all pollutants and averaging periods would be below the corresponding standards, which is similar to Alternative 1.
- Total impacts resulting from the National Ambient Air Quality Standards analysis would be dominated by the background concentration values rather than by emissions from the airport.

The Alternative 2 results presented in Tables 36 and 43 would translate into a negligible change from Alternative 1 pollutant emissions for modeled years 2015 and 2025. The changes would be so small that they would not be discernable from variations that occur in climatologic conditions among years.

Under Alternative 2 after 2033, without another agreement extension that would require an analysis of impacts under the National Environmental Policy Act, it is likely that the airport would lose its Part 139 certification and scheduled passenger service aircraft operations would cease, with general aviation operations continuing until 2053. Thus, impacts after 2033 under Alternative 2 would be similar to those described for Alternative 1 in 2015.

Effects on Health Concerns as Indicated by the Air Quality Index

Table 43 shows the modeled Air Quality Index values that would occur with the implementation of Alternative 2 in 2015 and 2025. Changes in emissions associated with this alternative would not be sufficiently large to change any of the Air Quality Index values compared to those that would occur under Alternative 1 or the modeled existing conditions baseline. As a result, the effects of Alternative 2 on human health, as indicated by the Air Quality Index, would be negligible.

After 2033, the impacts under Alternative 2 would be similar to Alternative 1 in 2015, which indicated no change in predicted Air Quality Index Values.

Effects on Lead Emissions from the Use of Leaded Gasoline in Piston-Engine Aircraft

Tables 35 and 43 include the analysis of emissions of lead in 2015 and 2025. No difference between years, or between Alternative 2 and Alternative 1, were demonstrated by modeling. Therefore, Alternative 2 would have a negligible impact on lead emissions and associated human health and environmental impacts.

After 2033, the impacts under Alternative 2 would be similar to Alternative 1 in 2015, which indicated a negligible change in modeled lead emissions from baseline.

TABLE 43: NATIONAL AMBIENT AIR QUALITY STANDARDS ANALYSIS FOR ALTERNATIVE 2 IN 2015 AND 2025

Pollutant	Averaging Period	Ambient Air Quality Standards (μg/m^3)	Background [a/] (μg/m^3)	Baseline Total [b/] (μg/m^3)	Baseline Air Quality Index [b, c/]	2015 Airport Emissions (μg/m^3)	2015 Total (μg/m^3) [d/]	2015 Air Quality Index	2025 Airport Emissions (μg/m^3)	2025 Total (μg/m^3) [d/]	2025 Air Quality Index
Sulfur dioxide	3-hour	1,300	16.5	195.3	--	121.5	138.0	--	121.5	138.0	--
	24-hour	365	8.4	51.8	29	36.8	45.2	29	36.8	45.2	29
	Annual average	80	2.6	11.6	--	1.3	3.9	--	1.3	3.9	--
Particulate matter (10 microns or less)	24-hour	150	93.0	104.1	75	11.1	104.1	75	11.1	104.1	75
	Annual average	--	21.0	21.5	--	0.5	21.5	--	0.5	21.5	--
Particulate matter (2 microns or less)	24-hour	35	23.3	34.4	98	11.1	34.4	98	11.1	34.4	98
	Annual average	15	6.8	7.3	--	0.5	7.3	--	0.5	7.3	--
Nitrogen dioxide	Annual average	100	5.6	17.1	--	10.0	15.6	--	9.9	15.5	--
Carbon monoxide	1-hour	40,000	1,832	4,968	--	2,770	4,602	--	2,587	4,419	--
	8-hour	10,000	1,718	2,959	30	1,096	2,814	30	1,024	2,742	30
Lead	Rolling 3-month average	0.15	0.04	0.048	--	0.008	0.048	--	0.008	0.048	--

a/ Background concentration values are from the final column in Table 11. **μg/m^3**= micrograms per cubic meter.
b/ Modeled existing conditions baseline values were calculated using Jackson Hole Airport operations from October 2004 through September 2005.
c/ Air Quality Index is only calculated for the 8-hour or 24-hour averaging periods for pollutants. All Air Quality Index values represent the highest modeled value for that averaging period at the airport boundary and were calculated using the procedures in Mintz (2009).
d/ Value represents emissions (column 7) plus background (column 4)

Effects on Prevention of Significant Deterioration Increment

The analysis of effects on the Prevention of Significant Deterioration increment involved subtracting the modeled existing conditions baseline results for a given pollutant and averaging period from the Alternative 2 values to produce the values in Tables 37 and 38. These values were then compared to the results to those calculated for Alternative 1 in the corresponding years.

The results for Class I areas in Table 37 show that for all combinations of future years, pollutants, and averaging period, the results for Alternative 2 are slightly higher than those of Alternative 1, but are still are well under the standard. In fact, most results are slightly negative, indicating an increment-expanding situation for impacts from future emissions relative to modeled existing conditions baseline emissions. The exception to this is for particulate matter for both the 24-hour and annual averaging periods, which shows that marginal increment consumption is possible for future particulate emissions relative to baseline emissions. The relative differences from Alternative 1 effects are negligible because they would not be discernable from variations that occur because of climatologic variations among years. A similar situation occurs for Class II areas where, in addition to particulate matter, Alternative 2 would result in a small increment consumption for nitrogen dioxide.

After 2033, the impacts under Alternative 2 would be similar to Alternative 1 in 2015.

Effects on Visibility

VISCREEN model results for Alternative 2 in 2015 and 2025 are presented in Table 39. Alternative 2 has slightly greater delta E and contrast values than those that would occur with Alternative 1. However, as described in the Alternative 1 analysis, the differences would not be perceptible to untrained observers, and the impact on visibility of this alternative would be negligible.

After 2033, the impacts under Alternative 2 would be similar to Alternative 1 in 2015.

Effects on Total Nitrogen and Sulfur Deposition in Sensitive, High-Elevation Lakes

The deposition results for Alternative 2 for 2015 and 2025 were compared to the deposition analysis thresholds shown in Table 34. They also are compared to total deposition that is estimate to be occurring from all other sources, and airport-related deposition estimated for the Alternative 1 to determine relative change.

Results show that impacts on the deposition rates for nitrogen and sulfur would be higher under Alternative 2 when compared with Alternative 1. However, all of the results for Alternative 2 showed reductions in deposition rates compared to those that are occurring under the modeled existing conditions baseline.

Using the model output from Noname-55 Lake in 2025 that are provided in the Table 7-10 series in Appendix H, Alternative 1 shows a 5-year maximum nitrogen deposition rate related to airport operations of 0.15 kilograms per hectare per year for both 2015 and 2025. Alternative 2 shows a 5-year maximum nitrogen deposition rate related to airport operations of 0.435 kilograms per hectare per year for 2015 and 0.427 kilograms per hectare per year for 2025. Thus, when comparing Alternative 2 to Alternative 1, there would be an increase in the nitrogen deposition rate related to airport operations of 0.285 kilograms per hectare per year in 2015, and 0.277 kilograms per hectare per year in 2025.

For sulfur, Alternative 1 showed a deposition rate of 0.024 kilograms per hectare per year in 2015 and 0.025 kilograms per hectare per year in 2025 (see the Table 7-11 series in Appendix H). Alternative 2 showed a rate of 0.053 kilograms per hectare per year in 2015 and a rate of 0.055 kilograms per hectare per year in 2025. Comparing Alternative 2 to Alternative 1 for sulfur deposition rates related to airport operations, there would be an increase of 0.029 kilograms per hectare per year in 2015 and 0.030 kilograms per hectare per year in 2025.

This would translate into an adverse, long-term, direct effect of moderate intensity for nitrogen and sulfur. The intensity is based both on the level of increase of airport-related deposition rates from Alternative 1 to Alternative 2, and an existing condition that already exceeds the critical load value.

The reduction in the rate of nitrogen deposition related to airport operations compared to existing deposition from all sources (including airport and non-airport sources) under Alternative 2 would be similar to that occurring under Alternative 1: about 0.1 kilograms per hectare per year in both 2015 and 2025. For sulfur, the difference between Alternative 2 and Alternative 1 for the overall deposition rate would be an increase of 0.03 kilograms per hectare per year. Therefore, the change in deposition rates for both nitrogen and sulfur from all sources under Alternative 2, when compare with Alternative 1, would be negligible. However, when looking at the increase in modeled deposition rates related to airport operations under Alternative 2, when compared to Alternative 1, the impact would be direct, long-term, adverse, and of moderate intensity. The nitrogen deposition rate from all sources would still exceed the critical value load of 1.5 kilograms per hectare per year as described in Chapter 3, and would continue to be of concern and may warrant potential mitigation. Mitigation measures proposed in Chapter 2 could include the conversion of airport boilers, generators, and other ground equipment to clean energy sources as well as pursuing ISO 14001 certification. These mitigation measures would reduce the deposition rates for both nitrogen and sulfur under Alternative 2, but may not reduce the rates below the critical value thresholds of 1.5 kilograms per hectare per year for high-elevation lakes and 4.0 kilograms per year for terrestrial alpine communities.

Under Alternative 2, an extension to the 1983 agreement would be granted and the airport could continue to operate until 2053. After 2033, however, the airport would once again likely lose its Part 139 certification if another extension was not granted, and scheduled passenger aircraft operations would cease, with only general aviation operations continuing. Therefore, after 2033, the direct impacts of Alternative 2 when compared with Alternative 1 would continue to be adverse, long-term effects of moderate intensity due to the extension of the agreement until 2053.

Effects on Climate Change

Table 40 presents the greenhouse gas emissions from aircraft operations at the Jackson Hole Airport for Alternative 2 in 2015 and 2025 relative those that were modeled for Alternative 1 and for the October 2004 through September 2005 baseline. Continued use of the airport for scheduled passenger service would result in greenhouse gas emissions at nearly the same level that currently is occurring, and approximately twice the level that would occur with Alternative 1. However, as described previously, the no action alternative would not eliminate aircraft-related greenhouse gas emissions, but would transfer them to the other regional airports that received additional aviation traffic that formerly used the Jackson Hole Airport. Because of the global nature of climate change, the cumulative impact of Alternative 2 on climate change relative to Alternative 1 would be negligible.

Cumulative Impacts

Under Alternative 2, an extension to the 1983 agreement would be granted and the airport could continue to operate until 2053. After 2033, however, the airport would again be in a position of losing its Part 139 certification if another extension was not granted. In that case, scheduled passenger aircraft operations would cease, with only general aviation operations continuing.

Under this alternative, airport emissions would continue to contribute to the emissions profile for the park, and would continue to affect air quality. The cumulative impacts would be the same as described for Alternative 1 prior to 2033, and would be adverse because of the added contribution of airport emissions to emissions from all other sources.

This is most important when considering cumulative impacts to high-elevation lakes and terrestrial alpine communities in the park. As described in Chapter 3, the existing deposition rates from all airport and non-airport sources are estimated at 5.8 kilograms per hectare per year for nitrogen and 3.2 kilograms per hectare per year for sulfur. Because these values already exceed the critical load values for high-elevation lakes and terrestrial alpine communities in Grand Teton National Park, it is likely that adverse changes to high-elevation lakes, and possibly to terrestrial communities, are already occurring. Therefore, operation of the airport until 2053 would continue to contribute to the exceedence of the critical load values and would perpetuate adverse conditions. While the worst-site contribution of the airport to the deposition rate (modeled for Noname-55 Lake) is estimated at 8%, and other, non-airport sources contribute 92% or more to the deposition rate, the cumulative impact of airport emissions on high-elevation lakes and terrestrial alpine communities would continue to be adverse until 2053. Mitigation measures proposed in Chapter 2, including potential conversion of airport boilers, generators, and other ground equipment to clean energy sources as well as pursuing ISO 14001 certification, would help to decrease the existing nitrogen and sulfur deposition rates, but may not reduce the rates below the critical load values estimated for Grand Teton National Park.

Conclusions

Table 44 summarizes impacts of Alternative 2 on air quality relative to results predicted by modeling for Alternative 1. The table identifies whether the impact would be beneficial or adverse relative to Alternative 1. All of the impacts would be direct and long-term.

Alternative 2 in 2015 and 2025 would increase the emissions of air pollutants from the Jackson Hole Airport relative to emissions that would result from implementing Alternative 1. For almost all parameters, the differences either were too small to measure in modeling, or would be too small to discern from the year-to-year variations that result from meteorological conditions. The impact intensity for these parameters was characterized as negligible.

When compared with Alternative 1, the only intensities that were greater than negligible were for tons-per-year emissions of the criteria pollutant carbon monoxide (adverse, direct, long-term, and minor) and deposition rates for nitrogen and sulfur (adverse, direct, long-term, and moderate).

Emissions from implementing this alternative would be lower in both 2015 and 2025 than emissions currently occurring under the modeled existing conditions baseline. Therefore, on a relative basis, impacts from Alternative 2 would be greater than those that would occur with Alternative 1, and less than those associated with the current condition.

Cumulatively, Alternative 2 would have adverse, long-term impacts because airport emissions would continue to contribute to the total emissions profile for the park, which adversely affects air quality.

TABLE 44: SUMMARY OF CONCLUSIONS REGARDING DIRECT IMPACTS OF ALTERNATIVE 2 ON AIR QUALITY COMPARED TO ALTERNATIVE 1

Factor	Alternative 2 2015	Alternative 2 2025
Effects on emissions of criteria pollutants		
Sulfur dioxide	Negligible (+7.1) [a/]	Negligible (+7.2) [a/]
Particulate matter (10 microns or less in diameter)	Negligible (+1.2) [a/]	Negligible (+1.1) [a/]
Nitrogen oxides	Minor adverse (+67.4) [a/]	Minor adverse (+66.8) [a/]
Carbon monoxide	Minor adverse (+99.5) [a/]	Minor adverse (+74.6) [a/]
Lead	No change	No change
Effects on ability to meet National Ambient Air Quality Standards (all averaging periods)		
Sulfur dioxide	Remains below standards	Remains below standards
Particulate matter (10 microns or less in diameter)	Remains below standards	Remains below standards
Particulate matter (2.5 microns or less in diameter)	Remains below standards	Remains below standards
Nitrogen oxides	Remains below standards	Remains below standards
Carbon monoxide	Remains below standards	Remains below standards
Lead	Remains below standards	Remains below standards
Effects on health concerns as indicated by the Air Quality Index scores		
Sulfur dioxide	Negligible (no change to score)	Negligible (no change to score)
Particulate matter (10 microns or less in diameter)	Negligible (no change to score)	Negligible (no change to score)
Particulate matter (2.5 microns or less in diameter)	Negligible (no change to score)	Negligible (no change to score)
Carbon monoxide	Negligible (no change to score)	Negligible (No change to score)
Effects on lead emissions from the use of leaded gasoline in piston-engine aircraft	Negligible (no change)	Negligible (no change)
Effects on Class I Prevention of Significant Deterioration increment within the significant impact (SIL) radius		
Sulfur dioxide, all averaging periods	Negligible consumption of increment	Negligible consumption of increment
Particulate matter (10 microns or less in diameter) 24-hour	Negligible consumption of increment	Negligible consumption of increment
Particulate matter (10 microns or less in diameter) annual	Negligible consumption of increment	Negligible consumption of increment
Nitrogen dioxide annual	Negligible consumption of increment	Negligible consumption of increment
Effects on Class II Prevention of Significant Deterioration increment		
Sulfur dioxide, all averaging periods	Negligible consumption of increment	Negligible consumption of increment
Particulate matter (10 microns or less in diameter) 24-hour	Negligible consumption of increment	Negligible consumption of increment

TABLE 44: SUMMARY OF CONCLUSIONS REGARDING DIRECT IMPACTS OF ALTERNATIVE 2 ON AIR QUALITY COMPARED TO ALTERNATIVE 1 (CONTINUED)

Factor	Alternative 2 2015	Alternative 2 2025
Particulate matter (10 microns or less in diameter) annual	Negligible consumption of increment	Negligible consumption of increment
Nitrogen dioxide annual	Negligible consumption of increment	Negligible consumption of increment
Effects on visibility	Negligible	Negligible
Effects on deposition in sensitive, high-elevation lakes		
Total nitrogen deposition	Moderate adverse (+0.285) [b/] Exceeds the CLV. [c/] Increases deposition relative to Alternative 1 but improves deposition relative to baseline.	Moderate adverse (+0.277) [b/] Exceeds the CLV. [c/] Increases deposition relative to Alternative 1 but improves deposition relative to baseline.
Total sulfur deposition	Moderate adverse (+0.029) [b/] Exceeds the CLV. [c/] Increases deposition relative to Alternative 1 but improves deposition relative to baseline.	Moderate adverse (+0.03) [b/] Exceeds the CLV. [c/] Increases deposition relative to Alternative 1 but improves deposition relative to baseline.
Effects on climate change	Negligible	Negligible

a/ All values are in tons per year. Values in parentheses are differences from modeled emissions of criteria pollutants from Alternative 1 and Alternative 2. Impact determinations were made based on impact threshold definitions developed for Air Quality in this EIS.

b/ Values are in kilograms per hectare per year and are based on the modeled 5-year maximum value for Noname-55 Lake. Values in parentheses are differences between Alternative 1 and Alternative 2 for modeled airport related deposition rates for nitrogen and sulfur. The values decrease from existing conditions but still remain above the critical load value and may warrant mitigation as proposed in Chapter 2.

c/ The critical load value (CLV) for high-elevation lakes in Grand Teton National Park is estimated at 1.5 kilograms per hectare per year and 4.0 kilograms per hectare per year for terrestrial alpine communities.

VISUAL QUALITY AND DARK SKIES

Analysis

Effects on the Visibility of Airport Facilities

Throughout the analysis period until 2033, the effects of Alternative 2 on the visibility of airport facilities and scenic integrity levels would be negligible. During this time, the Jackson Hole Airport Board could make changes within the development subzone, such as replacing existing buildings with new buildings and/or increasing the number of buildings to support changes in scheduled passenger service and general aviation activities. However, all development would continue to be restricted to the development subzone, and the current height restrictions and color scheme would be maintained. Changes in building arrangements would not be apparent except in foreground views (which have no scenic integrity), because the current buildings already appear as largely continuous throughout the entire length of the development subzone from observation points outside the airport.

As described for Alternative 1, additional screening by trees may further reduce the visibility of airport structures. However, the improved screening would not alter the moderate scenic integrity of the landscape that would be seen from observation points along U.S. Highway 26/89/191.

Effects on the Scenery and the Visibility of Broad or Distant Vistas

As described for Alternative 1, effects on scenery would be indirect and would result from changes in the visibility of flying aircraft, and their tendency to draw the viewer's attention away from the scenery to the aircraft itself and to the airport in the midground view. By 2025, there would be a 1.5% increase in the more noticeable large air carrier aircraft compared to current conditions (see "Park and Airport Operations" section).

From viewpoints along U.S. Highway 26/89/191 between the Teton Point Turnout and airport road intersection, observant viewers in 2025 may see up to 35% more aircraft than under current conditions, but no perceptible change in the number of large aircraft. Even during the busiest airport operations periods, observers probably would not perceive a substantial increase in the frequency in aircraft passing between them and the Teton Range (currently about one every four minutes when aircraft are arriving from and taking off toward the north), in part because the air traffic control tower would require aircraft to maintain adequate spacing. Most observers would experience a negligible change in the scenic integrity level of the background mountain landscape compared to current conditions. For observers who noted a change in the frequency of the passage of aircraft, the scenic integrity may decrease by up to one level, from very high to high. However, because the change would be extremely short-term, lasting a few seconds, the intensity of the direct, adverse effect on the background view would be minor.

Effects on Light Emissions and the Visibility of Dark Skies

Alternative 2 would have negligible effects on light emissions from the Jackson Hole Airport or the visibility of dark skies within the airport boundary for the same reasons that were described for Alternative 1.

With increased airport use, light emissions from automobile headlights along the airport road and U.S. Highway 26/89/191 between the airport and Jackson would increase, particularly during the winter. Because automobile headlights are focused down onto the road, skyward fugitive emissions from this source would be limited. Particularly along U.S. Highway 26/89/191, the effect of additional headlights from increased airport traffic would be less perceptible when combined with headlights from other travelers. During moonless, cloudless evening, night, and early morning periods, observers close to the road might be able to perceive a one-step change in the visible magnitude of the night sky. This would be a direct, long-term, adverse effect of minor intensity. At all other times and locations, the adverse effect of headlights associated with Alternative 2 on the visibility of the night sky would be negligible.

Regional changes in the visibility of dark skies as a result Alternative 2 would be negligible.

Cumulative Impacts

Cumulative effects on visual quality for Alternative 2 would be the same as those described for Alternative 1.

The cumulative effects on dark skies that were described for Alternative 1 also would apply to Alternative 2. In addition, cumulative effects would occur because the Jackson Hole Airport is an important contributor to the local economy. Its presence indirectly facilitates the development of the area and increases demand for housing and supporting services. As a result, the continued operation of the airport under Alternative 2 would lead to an increase in outdoor lighting compared to current and Alternative 1 conditions. Because town and county requirement for the control of fugitive emissions would be enforced for all new development, the cumulative increase in light emissions from ongoing growth plus growth facilitated by Alternative 2 would not result in regional changes in the visibility of dark skies.

Conclusions

Alternative 2 would have a negligible effect on the visibility of airport facilities. Increased air traffic associated with this alternative would cause indirect, adverse effects of minor intensity for some viewers at observation points along U.S. Highway 26/89/191 between the Teton Point Turnout and airport road intersection.

Within the Jackson Hole Airport boundary, Alternative 2 would have negligible effects on the visibility of dark skies. Along the airport road and U.S. Highway 26/89/191 between the airport and Jackson, increased light emissions from headlights associated with increases in airport-related traffic would result in a direct, long-term, adverse effect of minor intensity during moonless, cloudless evening, night, and early morning periods, and negligible impacts at all other times.

Alternative 2 would have negligible effects on the cumulative changes in visibility of dark skies that would occur in Jackson or areas of Teton County outside the immediate vicinity of the airport.

There would be no impairment to the visual quality or dark skies of the park because the impacts associated with Alternative 2 would not likely be perceptible or measurable when compared with existing visual conditions or those occurring with Alternative 1. In some locations visitors may notice a one-step change in the observable magnitude of night skies, but the change would be, at most, minor in intensity and not rise to the level of impairment.

WATER QUALITY AND HYDROLOGY

Analysis

Surface Water

Compared to the Alternative 1 general aviation period, the effect of continued operation of the Jackson Hole Airport on hydrology would be negligible. The long distances to water bodies, flat topography, absence of direct surface water discharge to any surface water feature, and highly permeable soils would prevent airport runoff from reaching area streams. Because development would be restricted to the already impervious surfaces of the development subzone, runoff volumes would not differ from those that would occur during the Alternative 1 general aviation period.

Compared to Alternative 1's post-closure condition, Alternative 2 would have a negligible effect on hydrology.

- The airport's impervious surfaces would remain, but runoff would infiltrate rapidly into the soil and would not cause problems such soil erosion or gullying.
- Measurable differences compared to Alternative 1 in surface or ground water flows would not occur within or outside the airport boundary.
- There would not be any detectable changes in surface water quality compared to Alternative 1, and all parameters would remain within the applicable water quality standards.

National Pollutant Discharge Elimination System-Permitted Outfalls

Compared to the Alternative 1 general aviation period, changes in water quantity or quality associated with permitted outfalls would be negligible. Similar volumes of treated storm water would be discharged from the ramp area outfall. Treated septic tank discharges would continue to be released at or below the permit limit of 7,514 gallons per day.

Effects on water quality would be negligible compared to the Alternative 1 post-closure period because best management practices would continue to ensure that pollutants were not entering the water system from the permitted outfalls. There would not be measurable differences in pollution levels or the ability to meet water quality standards. Hydrologically, impacts would be negligible because all water used onsite would continue to originate onsite, and there would not be any measurable changes in the water table height or the volumes of ground water within or at the airport boundary.

Fuel Spills and/or Leaks

Under Alternative 2, the airport would continue to employ best management practices to prevent and control fuel spills and leaks. This would ensure that effects on water quality would be negligible compared to both the general aviation and post-closure periods of Alternative 1.

Glycol Deicer Storage, Use, and Disposal

The use of propylene glycol deicer would continue. However, there is no evidence that this product is adversely affecting water quality within or outside the airport. Therefore, effects of its continued use, compared to the general aviation and post-closure periods of Alternative 1 would be negligible.

Aircraft and Rental Car Maintenance Operations

Under Alternative 2, the Jackson Hole Airport Board would continue to ensure that the car rental companies and fixed-base operator used best management practices to prevent the contamination of surface runoff or ground water by oils, greases, and solvents used during maintenance operations. Their continued careful management would ensure that effects on water quality would be negligible compared to both the general aviation and post-closure periods of Alternative 1.

Discharges to the Enterprise Canal

The Enterprise Canal would continue to be unaffected by airport operations and would experience negligible impacts from Alternative 2.

Cumulative Impacts

Area-wide cumulative impacts from Alternative 2 would be the same as those described for Alternative 1.

Conclusions

Alternative 2 would have a negligible impact on hydrology.

Because the use of water quality best management practices would continue to prevent surface and ground water pollution, Alternative 2 would have a negligible effect with regard to National Pollutant Discharge Elimination System-permitted outfalls for storm water and septic tanks; fuel spills and/or leaks; glycol deicer storage, use, and disposal; aircraft and rental car maintenance operations; and discharges to the Enterprise Canal.

There would be no impairment to water quality or hydrology under Alternative 2. The impacts under this alternative are anticipated to be negligible, which means that any impacts that may occur would not be measurable and all water quality parameters would continue to be consistent with all water quality standards for the designated use. Thus the impacts would not rise to the level of impairment.

WILDLIFE AND THEIR HABITATS, INCLUDING SPECIAL CONCERN, THREATENED, AND ENDANGERED SPECIES

Analysis

Habitat Effects on General Wildlife

Until 2033, effects on general wildlife and their habitats would be the same as those described for Alternative 1. The impacts of this alternative would be negligible. Any change would be at or below the level of detection and would be of little or no consequence to wildlife populations in general.

After 2033, there would be no closure and removal of the airport and, thus, no restoration of 128 acres of wildlife habitat. The fence would continue to prevent large animals from using the 533 acres within its boundary. This would result in a minor, direct, long-term, adverse impact compared to Alternative 1 after 2033, but a negligible impact compared to current conditions. While there may be adverse impacts to individuals, they would be localized and would not be of consequence at the population level.

Habitat Effects on Migratory Birds and Species of Concern

Prior to 2033, Alternative 2 would have negligible impacts on migratory birds, raptors, birds that use the Snake and Gros Ventre River corridors for nesting and foraging, or bats and other special-concern mammals that use the land within the airport perimeter. After that year, current conditions would persist, compared to restoration that would occur with the no action alternative. This would result in minor, direct, long-term, adverse impact compared to Alternative 1, but a negligible impact compared to current conditions. While there may be adverse impacts to individuals, they would be localized and would not likely be of consequence at the population level.

Habitat Effects on Endangered or Threatened Species

Effects of Alternative 2 on the black-footed ferret, Canada lynx, gray wolf, and grizzly bear would be negligible, even after 2033. For both alternatives, threatened and endangered species would experience negligible effects, the equivalent of a U.S. Fish and Wildlife Service "no effect" determination.

The U.S. Fish and Wildlife Service does not provide concurrence with a "no effect" determination. Therefore, the NPS requested, and the U.S. Fish and Wildlife Service provided, a letter confirming NPS compliance with section 7 obligations under the Endangered Species Act. This correspondence is included in Appendix A.

Habitat Effects on Greater Sage-Grouse (Candidate Species)

Prior to 2033, there would be minor, direct, long-term, adverse impacts on the sage-grouse compared to Alternative 1. These impacts would be related to the higher potential for bird mortality from strikes with jet aircraft that would be providing scheduled passenger service under this alternative. Impacts on habitat availability and lek use would be negligible.

After that year, the sage-grouse would continue to experience adverse impacts from airport-related operations and would not experience the Alternative 1 benefits associated with eliminating aircraft and ground operations and restoring 128 acres of habitat. The resulting impact would be minor, direct, long-term, adverse, and of little consequence to the local sage-grouse population or sage-grouse throughout their range.

Aircraft Sound Effects on Wildlife

Figures G-23, G-25, G-28, and G-30 in Appendix G show the 15-hour sound energy level of airport operations for Alternative 2 in 2015 and 2025 for all-year and peak-season conditions. Comparisons with the similar maps for Alternative 1 show that the areas affected by aircraft sound are slightly larger for Alternative 2. The contrast is most apparent between Figures G-29 and G-30, which show the peak season for the two alternatives in 2025. These differences probably are not sufficient to affect any features of wildlife behavior or physiology related to sound, and would have a negligible impact on wildlife.

Alternative 2 would continue to produce sound related to aircraft operations after 2033. The impact on wildlife, including sage-grouse, would be minor, long-term, adverse, and direct compared to Alternative 1, although the impact compared to current conditions would be negligible.

Effects of Airport Ground Vehicles and Traffic on Wildlife

There would be a negligible difference between the two alternatives regarding the mortality effects of airport ground vehicles on wildlife. Alternative 2 would result in higher mortality of wildlife on highways because of the larger number of vehicles associated with airline passenger service. This would result in long-term, direct, adverse, minor impacts on wildlife both before and after 2033, but would have little or no consequence at the population level.

Effects of Collisions between Birds and Aircraft

The difference in the number of operations at the Jackson Hole Airport between the two alternatives would result in a proportional difference in the number of collisions between birds and aircraft.

However, as discussed in the cumulative impacts evaluation for wildlife in Alternative 1, relocating scheduled passenger services in 2015 and closing the airport in 2033 would displace the bird strike problem for most species to another location rather than decreasing the total number of strikes. Therefore, while Alternative 2 would have an adverse effect on the number of bird strikes locally, the net effect regionally compared to Alternative 1 would be negligible.

Sage-grouse do not occur at other airports, such as the Idaho Falls Regional Airport, that might handle air traffic that Alternative 1 would displace from the Jackson Hole Airport. Therefore, impacts on this species were considered separately. Alternative 2 would result in increased mortality of sage-grouse from aircraft/bird collisions at the rate of about one bird per year, both before and after 2033. This would result in a long-term, direct, adverse impact of minor intensity.

Cumulative Impacts

Cumulative impacts for Alternative 2 would be similar to those occurring with Alternative 1. However, because it would not lead to the restoration of 128 acres of sagebrush habitat, Alternative 2 would make no contribution toward countering the long-term trend of wildlife habitat losses in Jackson Hole. As discussed above regarding collisions between birds and aircraft, it also would not change the locations of where these incidents occurred.

Conclusions

Until 2033, impacts would be negligible on general wildlife habitat availability and on habitat of migratory birds and species of concern. After 2033, impacts would be minor, long-term, direct, and adverse compared to Alternative 1 but negligible compared to current conditions.

Impacts on habitat of endangered or threatened species would be negligible before and after 2033. This finding equates to a “no effect” determination under section 7 of the Endangered Species Act.

Habitat effects on greater sage-grouse would be minor, long-term, direct, and adverse both before and after 2033.

Until 2033, aircraft sound effects on wildlife would negligible. After that year, sound would have a minor, long-term, direct, adverse effect on wildlife, with little consequence at the population level.

Effects of collisions between birds and aircraft would be negligible, except for sage-grouse. Impacts on this species would be long-term, direct, adverse, and of minor intensity

Alternative 2 would result in higher mortality of wildlife on Jackson Hole area highways, resulting in long-term, direct, adverse, minor impacts on wildlife. However, continuing scheduled passenger service into Jackson would avoid displacing flights to other airports farther away, and the wildlife mortality that would have occurred from passengers driving the highways between those locations and Jackson. The net effect on wildlife would be negligible.

Alternative 2 would have a negligible contribution to ongoing trends of wildlife habitat loss that are occurring because of development throughout the region.

Impacts on wildlife and their habitats, including special concern, threatened, endangered, and candidate species, would not rise to the level of impairment under Alternative 2. The intensity of impacts for wildlife would be no greater than minor. Individuals of multiple species may be affected, but those effects would be localized and would not be detectable at the population level. Sage-grouse would continue to experience minor adverse impacts, which may adversely impact individuals, but changes are unlikely to negatively affect the population. Because the intensity of impacts would not be greater than minor and would not adversely affect the values protected under the Organic Act, there would be no impairment of the wildlife resource under this alternative.

PARK AND AIRPORT OPERATIONS

Analysis

Operation of Grand Teton National Park

Under Alternative 2, the National Park Service would continue to commit staff time and funding for the ongoing coordination and oversight associated with the continued operation of the airport. No increase in staffing or funding is anticipated, although additional staff and funds could periodically be assigned to airport-related duties as circumstances warranted. For example, development of a soundscape management plan for the park, or other mitigation activities, could temporarily increase the NPS commitment of resources. Similarly, planning and development of a transit system that served the park, including the airport, could result in an additional commitment of NPS resources.

The National Park Service would continue to receive payments from the Jackson Hole Airport Board, based on the existing terms of the agreement. To the extent that operating revenues of the airport increased or decreased, payments to the National Park Service would similarly increase or decrease. No substantial change in the payments made by the Board would occur unless the National Park Service and Board negotiated a new schedule, consistent with applicable laws, regulations, and policies.

The National Park Service would continue to devote a similar level of resources to the airport as it currently does. Compared to Alternative 1, this alternative would have a long-term, minor, adverse impact on the NPS' operation of Grand Teton National Park.

Interagency Helibase Operations

Alternative 2 would result in negligible changes on the operation of the interagency helibase. The agencies would continue to obtain water, sewer, and electricity from the airport's systems.

Over time, as the level of air traffic associated with the airport increased, the need for coordination of flight operations between the helibase and airport would increase. At times, this could result in short delays in the ability of helicopters using the helibase to takeoff, land, or otherwise operate in the airport area. The intensity of the long-term, adverse, direct impact on helibase operations would be minor.

Airport Facilities and Infrastructure

Under Alternative 2, the terms of the agreement regarding airport improvements would remain in effect. The Jackson Hole Airport Board would be allowed to construct such improvements as are necessary for the operation of the airport, subject to the requirements pertaining to the development subzone and the airfield itself. The Board would likely make periodic revisions to the airport master plan, consistent with the terms of the agreement. Thus, while the airport would not remain static from a development perspective, any future improvements would be consistent with the existing terms of the agreement. Should the Jackson Hole Airport Board propose any improvements that are not consistent with the terms of the agreement, they could only be considered through an appropriate process that provided compliance with the National Environmental Policy Act, and would potentially require both parties to agree to an amendment to the agreement. Any proposal that would expand the footprint of the airport (that is, increase its size beyond the current 533 acres) or extend the length of the runway would be considered only in a National Environmental Policy Act process that also would consider relocation of the airport to an alternate site outside the park.

The effects of Alternative 2 relative to the airport's operations would be associated with the Board's continuing ability to operate, maintain, and upgrade the runway, taxiway, passenger terminal, safety equipment, roads and parking, and all other facilities that enable the airport to support scheduled passenger and general aviation. Because the Board already has these responsibilities, and would be able to maintain eligibility for Federal Aviation Administration grants, the effects of Alternative 2 would be long-term, direct, moderate, and beneficial.

Airport Operations and Use Patterns

Under Alternative 2, the Jackson Hole Airport would be able to maintain its Part 139 certification and continue to operate as a primary, non-hub airport. As shown in Table 33, future operations are forecast to be approximately 36,600 by 2025. This would include approximately 9,300 scheduled passenger operations and about 27,000 general aviation operations, including unscheduled air taxis such as charters and fractional ownerships. The number of operations is slightly larger than the 2005 baseline year, and does not represent an increase beyond the airport's current capability.

In comparison to the 2005 baseline year and the airport's current operations, the change in operations and airport use would be long-term, direct, beneficial, and minor. The airport would continue to provide both scheduled passenger service and support for general aviation. Use of the airport would continue to be variable on a seasonal basis and from year to year, depending on economic trends and other factors.

Passenger enplanements would likely continue to increase, requiring the Board to accommodate larger numbers of people through ticketing, security screening, outgoing and incoming baggage handling, rental cars, and food and retail service in the terminal's restaurant and gift shops. While the size of the development subzone limits expansion of facilities such as parking, the recent terminal expansion within the subzone's constraints demonstrates the Board's ability to accommodate greater numbers of passengers and, especially, the peak flows that result from airline scheduling.

Compared to the 2005 baseline year (see Tables 8 and 33), scheduled passenger operations would increase from 8,419 operations to 9,321, an approximate 10% increase. General aviation operations would increase from 24,586 to 27,286 operations, a 10% increase. Thus, the proportion of scheduled passenger to general aviation operations would remain essentially constant, and the operational profile of the airport would be generally unchanged. It should be noted that the forecast does not envision any larger aircraft to be operating at the airport than those currently in use.

Comments during scoping indicated concern that extending the 1983 agreement would enable the Jackson Hole Airport to grow from a small, local airport used primarily by area residents into a regional or national airport with heavy commercial use. As noted earlier, the Jackson Hole Airport is currently classified as a primary non-hub airport based on the number of enplanements. As described above, the forecast indicates that the mix of operations and fleet characteristics would remain about the same as at present through the forecast period. In addition, the terms of the 1983 agreement place significant limitations on the development characteristics of the airport.

Alternative 2 would extend the authorized term of the agreement until 2053, 20 years beyond the current expiration date of April 27, 2033. Assuming that the Board exercises both additional 10-year options and remains in compliance with the terms of the agreement, after 2033 there would once again be fewer than 20 years remaining on the term of the agreement. Unless there was a change in circumstances regarding grant assurances from the Federal Aviation Administration, the Jackson Hole Airport Board would once again be in the same position as currently exists. Therefore, without additional action to further extend the term of the agreement or otherwise ensure the Board's eligibility for Federal Aviation Administration funding, the same conditions would exist as those described for the general aviation period of Alternative 1.

Cumulative Impacts

The implementation of Alternative 2 would maintain the potential for amendments to the 1983 agreement that would allow for the future modifications of airport facilities. Any such proposals, regardless of whether they were within or outside the development subzone, would require an amendment to the 1983 agreement and would be subject to the National Environmental Policy Act process to inform and involve the public and to disclose impacts. An amendment to the 1983 agreement also would have to be approved by the U.S. Department of the Interior.

Conclusions

For the National Park Service, the effects of Alternative 2 on the operation of Grand Teton National Park would be long-term, minor, and adverse as a result of the ongoing need to commit park resources to address operation of the airport. Impacts on interagency helibase operations would be negligible to minor.

Effects regarding airport facilities and infrastructure would be long-term, direct, moderate, and beneficial. This alternative would continue the airport's eligibility for Federal Aviation Administration grants, which would enable the Jackson Hole Airport Board to continue to operate, maintain, and upgrade the runway, taxiway, passenger terminal, safety equipment, roads and parking, and all other facilities that enable the airport to support scheduled passenger and general aviation.

The effects of Alternative 2 on airport operations and use patterns would be long-term, direct, beneficial, and negligible to minor. This includes impacts to numbers of operations and passenger enplanements, operational profile with regarding the mix of scheduled passenger and general aviation operations, and aircraft sizes in the fleet mix that uses the airport.

PUBLIC HEALTH AND SAFETY

Analysis

Safety Associated with Airport Flight Operations

Alternative 2 would enable the Jackson Hole Airport to demonstrate a satisfactory property interest in the site and allow it to maintain its eligibility for Federal Aviation Administration funding for an additional 20 years. It could continue to apply for and receive available federal funds, based on need, for key operational and safety features such as upgraded navigational aids, safety equipment, and refurbishing of the runway and taxiway. Funds from other sources could then continue to be available to maintain the current high levels of training that will help ensure adequate response to emergency situations. Operation of the tower would be assured under Alternative 2. It is expected that ongoing technological advances in all of these areas would lead to incremental improvements in safety over time. The resulting direct, long-term, beneficial effect of these improvements on public health and safety would be minor.

Alternative 2 would have a negligible effect on the incident rate recorded for the Jackson Hole Airport.

Community Well-Being

The effects of Alternative 2 on community well-being, including medical evacuations for health- or life-critical conditions, would have negligible effects on public health and safety for the same reasons described for Alternative 1. Visiting physicians services that use the Jackson Hole Airport could continue, resulting in a negligible impact.

Emergency Response

Emergency response services, such as search and rescue and wildland fire fighting, would continue to be conducted from the interagency helibase within the airport boundary. Increased scheduled passenger service and general aviation air traffic associated with Alternative 2 could increase the potential for conflicts with emergency response flights. However, the presence of the control tower would likely be able to coordinate these activities, and thus impacts on public health and safety would be negligible.

Public Health and Safety on Highways

This analysis used the same assumptions that were used for Alternative 1. As described for that alternative, effects on public health and safety on highways were caused by changes in traffic volumes, as people who wanted to access the area by air drove different distances in automobiles to get from or to their destination airport. Because Alternative 2 would not change the destination airport to and from which people were driving, it would have a negligible effect on highway safety.

Public Health and Safety Relating to Hazardous Materials at the Airport

Under Alternative 2, greater volumes of fuels, lubricants, and solvents would be used at the airport. However, the Jackson Hole Airport Board and fixed-base operator would maintain their record in the safe handling of hazardous materials. Effects of Alternative 2 would be negligible, because of the continued absence of accidents that threaten public health and safety.

Cumulative Impacts

Safety Associated with Flight Operations. Unlike Alternative 1, the action alternative would not result in the displacement of flight operations to other airports. The cumulative effect of this alternative on flight operations, including their safety, at other airports would be negligible.

Community Well-Being. People who wanted medical evacuations using chartered fixed-wing aircraft or emergency medical tickets on scheduled passenger service flights could continue to obtain these services from the Jackson Hole Airport and would not need to travel to other airports to secure flights. Cumulative effects of Alternative 2 on other airports and communities would be negligible.

Emergency Response Services would continue to be provided from the interagency helibase. The cumulative effect of Alternative 2 on the ability of agencies to provide emergency response throughout the region would be negligible.

Public Health and Safety on Highways. Alternative 2 would not result in the need for visitors to the area to fly into more distant airports and drive to Jackson. However, the continuing access to the area by air, and the increases in air traffic that would result over time with the implementation of either action alternative, would have cumulative effects with other factors that are encouraging population growth in the area. Collectively, these would contribute to regional increases in automobile traffic and increases in the numbers of traffic-related injuries and fatalities.

Hazardous Materials. Alternative 2 would not result in the increased use of hazardous materials, such as fuels, lubricants, and solvents, at other airports. The cumulative effect on safety relating to these materials would be negligible.

Conclusions

Direct, long-term, beneficial effects of minor intensity would result from the ability to pay for upgraded navigational aids, safety equipment and training, and refurbishing of infrastructure such as the runway and taxiway. Alternative 2 would have negligible effects on public health and safety associated with medical evacuations, visiting physicians services, emergency response, health and safety on highways, and hazardous materials.

SOCIOECONOMICS

Analysis

Under Alternative 2, the authorized term of the agreement between the Department of the Interior and the Jackson Hole Airport Board would be extended by 20 years through the addition of two 10-year options that the Board could exercise in 2013 and in 2023. Existing facilities, economic processes, and linkages between the airport and the surrounding communities and governments would remain essentially unchanged. The description of impact intensity is based on comparing the incremental difference between conditions with Alternative 2 to existing conditions.

If the effects were considered in the context of the incremental difference between the Alternative 2 conditions and Alternative 1 conditions (end of scheduled passenger service by 2015 and airport closure in 2033), the impact intensities would generally be moderate and major, depending on the specific economic metric.

Effects on the Economy of Jackson and the Region

Under Alternative 2, the Jackson Hole Airport would function essentially in its current fashion, would remain a key component of the local and regional economy, and would continue to provide convenient access for visitors to the Jackson area. The overall socioeconomic benefits under this alternative would be direct and indirect, long-term, and minor compared to the economic benefits being generated by current airport operational conditions. Trends in enplanements and operations at the Jackson Hole Airport were shown in Tables 17 and 18, respectively, in the "Park and Airport Operations" section. Projections in operations for 2015 and 2025 were provided in Table 33 in the Alternative 1 analysis.

Local and regional economic features, such as employment, earnings, business volume, and government revenues, would continue to grow at reasonably consistent rates under this alternative. During the 1997 through 2004 period, direct travel spending and associated travel-generated earnings in the Jackson area increased at an annual rate of about 5% (Dean Runyan Associates 2005). During the period from 1990 to 2000, the local and regional economy grew at an annual rate that exceeded population growth. With the implementation if Alternative 2, it is likely that these trends would continue, and that the Jackson area and Teton County would experience continued economic growth because of the presence of non-local visitors.

Although the economy as a whole would incur benefits, some potential adverse impacts could result from continued economic growth and expansion. For example:

- Affordable housing would continue to be an issue that could become more acute.
- It could become more difficult for community and public agencies to provide quality, efficient, and convenient services.

Teton County, Idaho would probably continue to experience growth and development caused by overflow from Teton County, Wyoming. For example, in April 2006, there were more than 30 development applications pending that included proposals for the development of more than 2,500 residential lots in Teton County, Idaho. Cheaper land and less expensive housing in Teton County, Idaho would continue to be the primary driving forces encouraging development.

Effects on Recreation outside Grand Teton National Park

Alternative 2 would result in negligible changes in the choices of vacation destinations made by non-local visitors. Most summer visitors would continue to arrive in the area by highways, and most winter visitors would continue to fly into the Jackson Hole Airport using scheduled passenger service to access the area's recreation resources and facilities.

The implementation of Alternative 2 would have negligible effects on the economic viability of recreation-related projects in the area because this alternative would represent a continuation of current conditions. For example, the Grand Targhee Resort master plan includes a proposal to more than triple its current skier capacity. The Jackson Hole Mountain Resort and Snow King Resort also have master plans that include expansion of current skier capacity and supportive facilities. Within the limitations posed by outside factors (such as the national economy and the current decline in the housing market), these and other recreation providers could continue their long-term planning with the assurance that visitors could continue to enter the area on scheduled passenger service via the Jackson Hole Airport. These resorts would continue to have a strong, positive effect, particularly on the area's winter economy.

Sustainability and growth in employment, personal incomes, and business volume would be expected locally and regionally as a result of operational stability at the Jackson Hole Airport. Long-term, direct and indirect, minor economic benefits would be incurred by summer and winter recreational destinations and activities in the Jackson region.

General Effects on Airport Use and Demand for Airport Services

Airport use and associated local and non-local demand for services would continue, increasing over time as the number of airport operations increased. The Federal Aviation Administration (2010) predicted annual increases for all categories of air transportation over the planning period. As population and business growth continues within the region, demand for use of the airport also will increase. The effect of implementing Alternative 2 would be long-term, direct and indirect, beneficial, and of minor intensity.

Effects on General Aviation Use of the Airport

Projections of general aviation use of the airport are identical for Alternative 1 and Alternative 2. Therefore, this alternative would have a negligible impact on general aviation use.

Effects on Scheduled Passenger Service Use of the Airport

The Federal Aviation Administration (2010) predicted that total domestic passenger enplanements on the national level would increase at an average annual rate of 2.4% between 2010 and 2030. Actual enplanements at the Jackson Hole Airport during the 10-year period 1999 through 2008 increased from 173,358 to 311,795, an 80% increase for the period. It is reasonable, therefore, to expect that enplanements at the Jackson Hole Airport would continue to increase between now and 2025. Factors that could limit growth in enplanements are changes in the airline industry, especially in regard to the number of flights that are economically viable for the airlines, changes in the United States and foreign economies, and the availability of lodging and other hospitality services in the Jackson Hole area.

Continued increases in demand for air service to Jackson would likely prompt carriers to use two approaches to accommodate passengers (The Boyd Group, Inc. 2007a). They are expected to increase the number of operations by the large air carrier class of planes (for example, Airbus A319 and 320, and Boeing 737 and 757. In a related action, they will phase out or diminish the use of commuter aircraft such as the 30-seat Embraer 120 and 37-seat Dash 8-100/200 models in favor of somewhat larger regional aircraft such as the Dash 8 Q400, Bombardier CRJ-700, and Bombardier CRJ-900, which each have seating for 68 to 86 passengers. These types of changes are already occurring

The increases in enplanements would have long-term, direct and indirect, beneficial impacts of minor intensity that are consistent with current planning.

Effects on Availability and Use of Airport Services by Area Residents

Alternative 2 would have a negligible effect on the existing ability of area residents to conveniently access major cities nationwide through the airport.

Effects on the Airport's Operations Revenues

Alternative 2 would have a negligible impact on the ability of the airport to generate revenues that were sufficient to finance scheduled passenger service and general aviation while maintaining rates that were "fair and reasonable" in conformance with section 9(b) of the 1983 agreement. There would not be any changes in the ability of the Jackson Hole Airport Board to collect fees directly associated with flight operations, such as landing and ramp fees, or to indirectly generate revenue from such sources as the lease of terminal space and automobile rental operations. Growth in operations revenues would continue in a pattern that was generally consistent with the past increases that were illustrated in Figure 12.

Effects on Federal Aviation Administration Funding

Implementation of Alternative 2 would allow the Jackson Hole Airport Board to meet the requirements of Title 14, Part 152 of the *Code of Federal Regulations,* sections 152.103 and 152.3 regarding a "satisfactory property interest." This would maintain the Jackson Hole Airport Board's current ability to compete with other airports nationwide for Federal Aviation Administration grant funding for capital improvements and would result in a negligible impact.

Effects on Quality of Life Factors in Jackson and the Region

Perceptions of "quality of life" are highly subjective. Therefore, this section summarizes some of the long-term changes associated with Alternative 2 that could alter opinions about the overall quality of life in Jackson and the surrounding area without identifying intensities or classifying them as adverse or beneficial.

Airport-related aircraft sound would continue within Grand Teton National Park and at surrounding locations. Effects were analyzed in the "Natural Soundscape" and "Visitor Use and Experience" sections. Effects on the general quality of life from airport-related sounds in Jackson and nearby areas would continue to be mitigated by the existing mitigations and the noise abatement plan, as well as any new provisions developed in the future.

The visual scene would continue to include the airport and the eye-catching movement of aircraft across the high-value natural landscape of the Teton Range. The potential for noticing aircraft would increase with the future increase in aircraft operations that would occur in association with Alternative 2.

Area traffic would continue to increase year-round. Summer increases primarily would be related to population increases in:

- Full-time and part-time residents who would be drawn to the Jackson and Teton County, Wyoming area by the attractive setting and the easy access to other cities through the airport; and
- Workers who moved to Lincoln County, Wyoming or Teton County, Idaho to provide services to the former group.

Winter traffic increases would result from continued expansion of recreation facilities, particularly ski resorts, which would increase winter visitation to the area and increase the requirements for winter employment, much of which would be drawn from neighboring counties.

Ongoing increases in population throughout the three-county area would result in the continuation of recent patterns of land use change that have involved the conversion of private agricultural lands to residential and commercial developments.

Demand for housing, including second homes, would continue to increase, which would maintain the current trend in increasing home prices.

Ongoing increases in the housing valuations, numbers of housing units, and sales tax receipts would continue to increase government revenue and the ability to provide community and public services.

Demand for such services, including the need to address larger numbers of crimes, also would continue to grow.

Cumulative Impacts

Alternative 2 would maintain the airport and its economic benefits in Teton County, Wyoming. Neighboring counties would continue to serve as bedroom communities for workers who would commute by roads to jobs in the Jackson area. Alternative 2 would not result in substantial changes in planning efforts at the local, state, or federal levels. For example:

- The owners of developments such as Teton Village and managers of the area's ski resorts would continue to implement planned expansions based on market conditions but without consideration of whether residents, business representatives, and visitors could readily access the area.
- Jackson and Teton County would continue to implement the comprehensive plan. However, periodic updates may require new land use practices and plans ensure sustainable, quality growth.
- The ability to provide affordable housing and efficient, quality public services would continue to be local and regional issues.
- Transportation planning by Wyoming and Idaho would not include any substantial changes in highway travel patterns, and traffic would continue to increase. Transit planning by the National Park Service, Southern Teton Area Rapid Transit, and other entities would continue to consider the Jackson Hole Airport as a potential site for a transit stop.
- The National Park Service, U.S. Forest Service, and other land managers would continue to use current visitation trends for future planning.

Implementation of Alternative 2 would not result in the need to change any of the land use plans, controls, and policies for the Jackson area. Conversion of private land from agricultural use to residential and commercial uses to support the growing population would continue under Alternative 2.

Conclusions

Continuing all of the current operations at the Jackson Hole Airport at least through 2033 would have long-term, direct and indirect impacts of negligible to minor beneficial intensity on the town of Jackson and surrounding counties. Socioeconomic components that would contribute to this condition would include the following:

- For recreation that occurs in the region outside Grand Teton National Park, this alternative would have negligible impacts in the choices of vacation destinations made by non-local visitors and in the economic viability of recreation-related projects such as ski resort expansions. Sustainability and growth, particularly in winter recreation would result in long-term, indirect, minor economic benefits.
- On and off the airport site, continued increases in airport use for scheduled passenger service would have minor, long-term, direct, beneficial impacts. Effects associated with general aviation would be negligible.
- The continued local availability of scheduled passenger service would have a negligible effect on the ability of area residents to conveniently access major cities nationwide through the airport.
- Impacts on the airport's ability to generate revenues to finance operations would be negligible.

- Impacts on the ability of the airport to compete for Federal Aviation Administration grant funding for capital improvements would be negligible.
- The effects on quality of life would depend on personal perceptions.

SURFACE AND AIR TRANSPORTATION

Analysis

Implementation of Alternative 2 would allow the Jackson Hole Airport to continue providing scheduled passenger air service, thereby serving local residents and visitors. The airport would continue to provide service to major hub airports such as Denver, Salt Lake City, Chicago, Dallas, and other cities, much the same as it does at present. Depending on economic conditions, demand, and other factors, actual destinations would be expected to vary over time, with some additional destinations being added, or some destinations no longer being served. In any event, the airport would continue to serve the needs of air transportation for Jackson Hole and the surrounding area.

Forecasts for system-wide air travel by the Federal Aviation Administration (2010) for the 20-year period from 2010 through 2030 predict that domestic scheduled passenger aviation capacity will increase at an annual rate of 3.6%; enplanements will increase at an annual rate of 2.4%; and general aviation hours flown will increase at an annual rate of 2.5%. These values are forecast for the nation as a whole, and are not necessarily representative of any particular airport. The forecast provided to the Jackson Hole Airport Board by Mead & Hunt (2009) shows an increase in the number of passenger enplanements over the 20-year period beginning in 2008, reaching 450,205 by 2028, with 37,084 total operations. With the continuation of scheduled passenger air service at Jackson, other airports in the region would not be affected by the potential increased demand for service at those locations that would occur under Alternative 1.

The continuation of scheduled passenger air service, and the associated increase in passengers would contribute to an increase in traffic volumes on U.S. Highway 26/89/191, especially the segments between the airport and Jackson. With the constraints of the development subzone, however, the airport would likely seek to implement or otherwise make available a transit system to reduce the need for on-airport public and rental car parking. The increased number of enplanements forecast by 2028 would represent about 3% of current park visitation, and would, therefore, contribute a relatively small additional amount to traffic volumes. Efforts to further reduce airport-associated traffic could include both visitor and employee shuttles, and the relocation of rental cars to an off-airport location outside the park.

Cumulative Impacts

The continuing access to the area by air, and the increases in air traffic that would result over time with Alternative 2, would have incremental effects with other factors that are encouraging population growth in the area. Collectively, these would contribute to regional increases in automobile traffic and decreases in the ability of the current roads to meet capacity demand.

Public or commercial transit, including planning, is an evolving area where substantial changes may occur regardless of whether the 1983 agreement for the Jackson Hole Airport is extended.

Conclusions

Alternative 2 would result in negligible effects on surface and air transportation because it essentially maintains the status quo with regard to use of the airport. Current trends with regard to air transportation, use of roads and highways both within and outside the park, and other transportation-related activities such as planning would continue.

UNACCEPTABLE IMPACTS AND IMPAIRMENT ANALYSIS

The guidance in *Management Policies 2006* (NPS 2006a) requires analysis of potential effects to determine whether or not actions would impair park resources. The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. Section 1.4.3 of *Management Policies 2006* states:

> *The fundamental purpose of all parks also includes providing for the enjoyment of park resources and values by the people of the United States . . . Congress, recognizing that the enjoyment by future generations of the national parks can be enjoyed only if the superb quality of park resources and values is left unimpaired, has provided that when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant. This is how courts have consistently interpreted the Organic Act.*

However, the laws give the National Park Service the management discretion to allow impacts on park resources and values when necessary and appropriate to fulfill the purposes of the park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within the park, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values. An impact to any park resource or value may, but does not necessarily, constitute an impairment, but an impact would be more likely to constitute an impairment when there is a major or severe adverse effect on a resource or value whose conservation is

- Necessary to fulfill specific park purposes identified in the establishing legislation or proclamation of the park; or
- Key to the natural or cultural integrity of the park; or
- Identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the park, visitor activities, or activities by concessioners, contractors, and others operating in the park.

Management Policies 2006 (NPS 2006a) recognizes that the impact threshold at which impairment occurs is not always readily apparent. Therefore, the National Park Service will apply a standard that offers greater assurance that impairment will not occur. The National Park Service will do this by avoiding impacts that it determines to be unacceptable. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment. Park managers must not allow uses that would cause unacceptable impacts; they must evaluate existing or proposed uses and determine whether the associated impacts on park resources and values are acceptable.

Related to determining whether unacceptable impacts or impairment may occur is evaluating the intensity of effects on each impact topic. The National Park Service characterizes those effects as negligible, minor, moderate, or major. The National Park Service defines "measurable" effects as moderate or greater impacts. It equates "no measurable effect" with minor or lesser impacts. "No measurable effect" is used by the National Park Service in determining if a categorical exclusion applies or if impact topics may be dismissed from further evaluation in an environmental assessment or environmental impact statement. This approach concentrates the effort on issues that are truly significant to the action in question, rather than amassing needless detail, and conforms with section 1500.1(b) of the Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act.

The National Park Service equates the term "major" effects (or impacts) to the term "significant" as used in the National Environmental Policy Act and its implementing regulations. It thus distinguishes between proposed actions and their associated effects that would require the preparation of an environmental impact statement, versus those that may require only preparation of an environmental assessment and finding of no significant impact. The term major, by itself, does not, and is not intended to have, a specific meaning in the context of the NPS Organic Act. Specifically, the term "major" does not by itself indicate an impact that rises to the level of impairment or that is "unacceptable" as described in *Management Policies 2006* (NPS 2006a). However, effects that are determined to be "major" are always evaluated as to whether they are unacceptable or rise to the level of impairment.

As defined in Section 8.2 of *Management Policies 2006* (NPS 2006a), unacceptable impacts are those that would:

- Be inconsistent with a park's purposes or values, or
- Impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the park's planning process, or
- Create an unsafe or unhealthful environment for visitors or employees, or
- Diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or
- Unreasonably interfere with
    - Park programs or activities, or
    - An appropriate use, or
    - The atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park, or
    - NPS concessioner or contractor operations or services.

Chapter 1 of this environmental impact statement describes the park's establishing legislation, its purpose and significance, and its fundamental resources and values. It also describes the NPS mission and mission goals, as well as special mandates, laws, policies, and administrative commitments that apply to management of Grand Teton National Park. Taking all of these into consideration, neither of the alternatives evaluated in this document would result in unacceptable impacts and, thus, neither would result in impairment of park resources and values.

- Neither alternative is inconsistent with the park's purposes and values. The Jackson Hole Airport has operated in its present location since the 1930s – prior to the establishment of either Jackson Hole National Monument or the present-day Grand Teton National Park. When Congress established the park in 1950, it knowingly included the airport within the boundaries, and also included provisions that allowed for the continuation of existing leases, permits, and licenses. Earlier that year, Congress had enacted the Department of the Interior Airports Act, authorizing the Secretary of the Interior to establish, regulate, and maintain airports within national parks when determined to be necessary, as was done in the 1983 agreement. That determination and other aspects of the 1983 agreement were challenged and upheld in a 1985 decision by the U.S. District Court for the District of Wyoming (*Sierra Club v. Watt,* Case No. C83-0406-B (D. Wyo. 1985)). Over the years since the park was established, the airport and park have evolved together, under a series of special use permits and the current 1983 agreement.

- Neither alternative would impede the attainment of the park's desired future conditions for natural and cultural resources. Desired conditions for each resource topic analyzed in this final environmental impact statement are presented in Chapter 4. With the exception of the park's natural soundscapes, the impacts of both alternatives on natural resources would range from negligible to moderately adverse, and would not be sufficient in their magnitude or intensity to impede the attainment of the park's desired future conditions.

  For natural soundscapes, either alternative would result in major adverse effects, based on the amount of the park affected by aircraft audibility of 10% or more of the time. However, as described in the analyses for that impact topic, the effects over the majority of the park would be much less in their magnitude, intensity, and duration. Most of the park would be substantially unaffected by aircraft sounds, which would occur infrequently and at low sound levels. Areas of the park in which natural sounds predominate, such as recommended wilderness, would be only slightly affected by the presence of the airport, and much of that area would be essentially unaffected. The effects of the airport would be most pronounced in areas of the park where, for most visitors, their experience is characterized by motor vehicle travel on park roads or the highway, or activities within developed areas. Ambient sound levels in these areas tend to be higher than the values used in the modeling, and the sounds from aircraft would be small in comparison to other non-natural sounds that are ubiquitous, such as those from motor vehicles. Thus, although the effects of the airport on the natural soundscapes of the park are characterized as major and adverse, the effects are not unacceptable in regard to attainment of the park's desired future conditions.

- The analysis indicated that neither of the alternatives would have a significant adverse effect on the health and safety of park visitors or employees.

- Under both alternatives, visitors would continue to have opportunities to enjoy, learn about, or be inspired by park resources and values. Neither of the alternatives would result in significant adverse effects on visitor use and experience. Under either alternative, visitors would continue to enjoy the same range of opportunities to enjoy the park that currently exist, including wildlife viewing, and a wide range of educational and recreational opportunities such as hiking, float trips, scenic touring, fly fishing, and climbing. Except for those areas of the park closest to the airport, noise and other effects of the airport that could affect visitor experience would be of low intensity, intermittent to infrequent in occurrence, and of short duration.

- The continued operation of the Jackson Hole Airport under either alternative would not unreasonably interfere with park programs or activities, other appropriate uses, or the natural soundscapes within wilderness, historic, or commemorative locations within the park. As described in the analysis, except for locations close to the airport, under either alternative, noise associated with the airport would be of low intensity, intermittent to infrequent in occurrence, and of short duration. Other effects would range from negligible to moderate in their intensity. While each alternative would have adverse effects, these effects would not be sufficient to unreasonably interfere with park programs or activities, other appropriate uses, or the natural soundscapes within wilderness, historic, or commemorative locations within the park.

  The Murie Ranch National Historic Landmark is located about 2.5 miles north of the airport and a half mile west of the extended runway center-line. As described in Chapter 1, the character-defining features of the ranch retain a high level of integrity despite the aircraft overflights, and the projected increase in operations would not diminish the integrity of the site for listing in the National Register of Historic Places. Therefore, there would be minor or lower impacts on the site.

- Neither alternative would unreasonably interfere with any NPS concessioner or contractor operations or services.

A determination of impairment also is completed for each park resource and value analyzed in this environmental impact statement. The negligible to moderate adverse impacts described for each resource topic, except natural soundscapes, are not sufficient in magnitude or duration to result in impairment. For natural soundscapes, both of the alternatives would result in adverse effects of major intensity. As described earlier, however, the term “major” does not equate to a specific meaning in the context of the NPS Organic Act, and does not necessarily indicate unacceptable impacts or impairment. The analyses in Chapter 4 for both alternatives found that neither would result in impairment. Furthermore, the unacceptable impacts analysis indicates that no unacceptable impacts would occur and, therefore, impairment of the natural soundscapes of the park would not result from implementation of either alternative.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

Consideration of long-term impacts and the effects of foreclosing future options are addressed in this section. The term "sustainability" refer to sections 102(2)(C)(ii), (iv),and (v) of the National Environmental Policy Act, not to the more recent context that includes green building standards. The intent of this analysis is to identify sustainable development that meets the needs of the present without compromising the ability of future generations to meet their needs.

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are those environmental consequences of an action that cannot be avoided, either by changing the nature of the action or through mitigation if the action is taken. Therefore, they would remain throughout the duration of the action.

The continued intrusion of aircraft sound on the natural soundscape and the quality of the visitor experience for some users of Grand Teton National Park would be an unavoidable adverse impact of either alternative. With the implementation of Alternative 1, the unavoidable adverse impacts on the natural soundscape and the visitor experience would decline and eventually disappear when the airport ceased operation after 2033. With Alternative 2, the unavoidable adverse impacts would continue for the term of the agreement. These unavoidable impacts would increase or decrease in direct proportion to the number and type of airport aircraft operations that would cross the park.

Alternative 1 would result in an unavoidable, major, long-term, adverse impact on the socioeconomic conditions of Jackson and Teton County with the loss of scheduled passenger air service. With Alternative 2, the airport and its scheduled passenger airline services would be major contributors to the continued economic welfare of Jackson and surrounding areas.

RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This determination identifies whether the proposed action would trade the immediate use of the land or resources for any long-term management possibilities, adversely affecting the productivity of park resources. This determination also discloses whether the proposed action or its alternative would be a sustainable action that could continue over the long term without environmental problems (NPS 2001a).

Neither alternative would result in substantial loss of natural resources or ecosystems in the park. The alternatives would involve an administrative action that would not result in alteration or permanent loss of park resources. In the short term, Alternative 2 would continue use the land within the airport boundary for airport operation and maintenance under current conditions, resulting in no change of natural resources within the property and outside the development subzone. In the long term, the airport property could be considered for potential facility development or expansion. Such a proposal would require review and authorization through the NPS environmental and regulatory compliance process. Jackson Hole Airport Board actions that would disturb or alter lands outside the development subzone would require review and approval by the National Park Service. With Alternative 1, there would be an increase in sagebrush steppe productivity as about 128 acres of currently developed area would be returned to biological productivity.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

This determination determines whether the proposed action or its alternative would result in effects or impacts that could not be reversed over the long term or would be permanent. An effect on a resource would be irreversible if the resource could not be reclaimed, restored, or otherwise returned to conditions that existed before the disturbance. An irretrievable commitment of resources involves the effects on resources that, once gone, cannot be replaced or recovered (NPS 2001a).

The decision to extend the 1983 airport agreement would not result in the direct irretrievable or irreversible commitment of resources. However, an indirect effect of extending the agreement would be the continued use of the airport by scheduled passenger service aircraft and the irreversible commitment of aviation fuels, gasoline, and other non-renewable fossil fuels. Neither alternative would be expected to result in the irreversible or irretrievable commitment of park resources.

Chapter 5
Consultation and Coordination

HISTORY OF PUBLIC INVOLVEMENT

Internal Scoping

Formal internal scoping meetings were held on October 11, 12, and 13, 2005 with the park Interdisciplinary Team (October 11 to 13, 2005) and with members of the Jackson Hole Airport Board staff (October 12, 2005). Field activities were conducted October 11, 2005 along the Snake River in the park to familiarize team members with the effects that aircraft approaching the airport can have on visitor experience.

The meeting on October 12, 2005 included representatives of the Jackson Hole Airport Board, National Park Service, and the environmental impact statement contractor, Parsons. The goals were to present issues; describe purpose and need concepts; discuss preliminary alternatives; review potential modifications to the 1983 agreement to be addressed by the environmental impact statement; identify preliminary resource concerns; discuss resource topics to be retained, dismissed, and evaluated in detail; and identify issues relating to with extending the airport agreement. Other scoping involved identification of resource issues by NPS resource and operations personnel.

The meeting on October 13, 2005 was held at Grand Teton National Park and included park staff and the environmental impact statement contractor. The planning meeting involved reviewing and explaining the airport agreement, identifying primary impact topics, discussing primary resource issues associated with impact topics, reviewing project background, identifying purpose and need, reviewing preliminary alternative action, planning the public scoping notification process, and defining a process for addressing noise abatement plan provisions in the environmental impact statement.

On April 24-25, 2006 a third Interdisciplinary Team meeting was conducted at Grand Teton National Park. This meeting involved park staff, the Intermountain Regional office, and the environmental impact statement contractor, Parsons. Topics addressed included the environmental impact statement status, soundscape impact analysis; cumulative impacts assessment approach; analysis approach; impact threshold definitions; and review of draft environmental impact statement sections. Since that time, there have been on-going Interdisciplinary Team meetings both internally with the park and in coordination with the Jackson Hole Airport.

Public Scoping

Based on the internal scoping meetings, the National Park Service prepared a newsletter to inform the public of the intent to prepare a National Environmental Policy Act compliance document on the Jackson Hole Airport agreement extension. The newsletter:

- Described the purpose and need for the extension of the 1983 agreement;
- Presented a map showing the affected area;

- Outlined three preliminary alternatives, including no action, extend the existing agreement, and update and extend the agreement;
- Identified the impact topics that most likely would be considered in the environmental impact evaluation;
- Provided an overview of the National Environmental Policy Act compliance process; and
- Invited the public to comment on any of the elements presented in the newsletter, or to provide additional information that might be useful in evaluating the agreement extension.

A press release was issued to inform all federal, state, and local officials and interested organizations that a newsletter soliciting public feedback on the project was published. The newsletter was mailed to all of the individuals and organizations that previously had indicated an interest in the management of Grand Teton National Park. Additional copies were provided at the Craig Thomas Discovery and Visitor Center at Moose and the Teton County public library. It also was posted on the Internet with links from the Grand Teton National Park web site and from the NPS' Planning, Environment, and Public Comment (PEPC) website at <http://parkplanning.nps.gov>.

A notice of intent to prepare an environmental assessment for the Jackson Hole Airport agreement extension was published in the *Federal Register* on December 28, 2005. The notice included much of the same information as the newsletter and provided an Internet address to access the newsletter. Similar information was provided in a public notice provided to the press on November 17, 2005.

The period for providing scoping comments ended on January 9, 2006. As a result of scoping, the National Park Service received 24 responses from other agencies and the public by letter, e-mail, or the Internet. Agencies that provided comments included the U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, and Wyoming Fish and Game Department. Comments were received from three organizations and 18 unaffiliated individuals.

Collectively, the responses from agencies and the public included approximately 250 individual comments. These were combined with the comments made by NPS staff and representatives from the Jackson Hole Airport Board, and then were sorted based on similar concerns. The comments resulted in the lists of issues that are provided at the ends of the "Methods" sections for each of the impact topics in Chapter 4 and that were systematically analyzed in the impact analysis. Comments that were not included among the issues were addressed in Chapter 1 under the heading "Alternatives or Actions Eliminated from Further Study" with a justification for why they were dismissed.

After looking at preliminary data, the National Park Service determined that its planning process would be better served, and the quality of its decision would be enhanced, by preparation of an environmental impact statement rather than an environmental assessment. The notice of intent to prepare an environmental impact statement was published in the *Federal Register* on August 9, 2007.

During scoping, the National Park Service sent letters requesting consultation with the U.S. Fish and Wildlife Service and Wyoming Game and Fish Department regarding endangered or threatened species within or near the Jackson Hole Airport site. A letter to the Wyoming state historic preservation officer requested consultation regarding cultural resources. The December 19, 2005 response from the U.S. Fish and Wildlife Service and January 6, 2006 response from the Wyoming Game and Fish Department are provided in Appendix A of this environmental impact statement. A written response was not received from the Wyoming state historic preservation officer. All of these agencies received copies of the draft environmental impact statement with a written request for their comments.

In November 2005, the National Park Service sent copies of the scoping brochure to the local tribes, including the Crow, Northern Arapaho, Northern Cheyenne, Eastern Shoshone, and Shoshone - Bannock Tribes. When the environmental impact statement was released to the public, the National Park Service sent letters to the tribes, formally asking for their input.

Public Comment and Review of the Draft Environmental Impact Statement

The *Jackson Hole Airport Use Agreement Extension Draft Environmental Impact Statement* was officially released for public comment with a notice of availability in the *Federal Register* on April 3, 2009. The draft environmental impact statement was placed on the NPS' Planning, Environment, and Public Comment (PEPC) website at <http://parkplanning.nps.gov> on March 27, 2009. The public comment period originally extended through June 3, 2009, but was extended to June 15, 2009 to allow for additional time for submitting comments. The National Park Service solicited comments from state, county, and town agencies and organizations; park neighbors; the Wyoming state historic preservation officer; and traditionally associated American Indian Tribes. The National Park Service also sent a letter announcing the availability of the draft environmental impact statement to the park's mailing list of private individuals and organizations.

Appendix E summarizes all the substantive comments received on the draft environmental impact statement and provides responses to comments, as required by the Council of Environmental Quality (1978) regulations for implementing the National Environmental Policy Act.

Agency Consultation and Coordination

The following six agencies provided comments on the draft environmental impact statement. Copies of these letters are included in Appendix E.

- U.S. Environmental Protection Agency;
- Governor, State of Wyoming;
- Wyoming Aeronautics Commission;
- Wyoming Fish and Game Department;
- Mayor, Town of Jackson; and
- Police Department, Town of Jackson.

The draft environmental impact statement also was sent to the U.S. Fish and Wildlife Service, and U.S. Forest Service Bridger-Teton National Forest. Neither of these agencies provided letters or other comments.

Compliance with section 7 of the Endangered Species Act was conducted through review and concurrence of the determination of "no effect" stated in the draft environmental impact statement. Because the U.S. Fish and Wildlife Service does not normally concur in writing for a "no effect" determination, and because it did not send a comment letter, the National Park Service requested a letter from this agency indicating successful compliance with section 7 for this project. This letter is included in Appendix A.

Consultation with the Wyoming state historic preservation officer and compliance with section 106 of the National Historic Preservation Act were conducted separately from preparation of the final environmental impact statement, based on that agency's initial comments on the draft document. Park staff coordinated with the state historic preservation officer regarding the project and a separate assessment of effect, and submitted a determination of "no adverse effect" on cultural resources listed or eligible for listing in the National Register of Historic Places. The state historic preservation officer concurred with this determination in January 2010. All correspondence relating to section 106 compliance is provided in Appendix A.

The draft environmental impact statement was sent to the following American Indian tribes for review and comment: Northern Arapaho, Northern Cheyenne, Crow, Eastern Shoshone, and Shoshone - Bannock Tribes. No comments were received on that document from any American Indian tribe.

Table 45 identifies the agencies, organizations, and experts consulted in the process of preparing this environmental impact statement. Where specific information from one of these people was cited, complete source information was provided in the "Bibliography" section.

TABLE 45: AGENCIES, ORGANIZATIONS, AND EXPERTS CONSULTED

Name	Agency or Organization
Tim Sieber	The Boyd Group, Inc.
Roman Piñon	Federal Aviation Administration
Sandra Simmons	Federal Aviation Administration
Tom Cole	Idaho Transportation Department
Raymond Bishop	Jackson Hole Airport
Doug Johnstone	Jackson Hole Airport
Brian Grubb	Jackson, Town of
Tamara Blett	National Park Service, Air Resources Division
John Bunyak	National Park Service, Air Resources Division
Shan Burson	National Park Service, Grand Teton National Park
Jennifer Carpenter	National Park Service, Grand Teton National Park
Kurt Fristrup	National Park Service, Natural Sounds Program
Lindsay Gillham	National Park Service, Environmental Quality Division
John Notar	National Park Service, Air Resources Division
Andrea Stacy	National Park Service, Air Resources Division
Karen Trevino	National Park Service, Natural Sounds Program
Chris Turk	National Park Service, Intermountain Region
Susan Wolff	National Park Service, Grand Teton National Park
Thomas Wood	Parsons
Virgil Boss	St. Johns Medical Center

Name	Agency or Organization
Sam Crowe	U.S. Department of Agriculture, Wildlife Services
Joyel Dhieux	U.S. Environmental Protection Agency
Larry Svoboda	U.S. Environmental Protection Agency
Mike Jimenez	U.S. Fish and Wildlife Service
Brian T. Kelley	U.S. Fish and Wildlife Service
Matthew Holloran	University of Wyoming
Stacey R. Adams-Gierisch	Wyoming Department of Transportation
Tory Thomas	Wyoming Department of Transportation
Bill Wichers	Wyoming Game and Fish Department

LIST OF PREPARERS

The people identified in Table 46 were primarily responsible for preparing this environmental impact statement. The table includes their expertise, experience, and roles in preparing this document.

TABLE 46: PREPARERS

National Park Service, Grand Teton National Park	
Mary Gibson Scott	Superintendent. B.A. in design, M.A. in architecture and urban planning, and 33 years of experience, including 29 years in national parks. Provided project oversight and review.
Shan Burson	Specialist in acoustics, NPS soundscapes, and ecology. B.A. in ecology; M.S. in ecology, evolution and behavioral biology; and four years of coursework and research toward a Ph.D. in biological sciences-ecology. Has 10 years of soundscape work in the National Park Service, and 16 years of ecological experience. Member of the interdisciplinary team, reviewed and consulted on soundscape sections.
Jennifer Carpenter	Environmental planning and compliance specialist. B.A. in ecology and evolutionary biology, M.S. in environmental resources and applied ecology, and 11 years of experience. Project manager after April 2007.
Carol Cunningham	Technical writer and editor. B.A. in English and 20 years of experience, including 8 years in NPS environmental planning and compliance. Assisted in preparation of the final environmental impact statement.
Peter Lindstrom	Cartographic technician. B.S. in geology and 5 years of experience. Provided map preparation and analyses to produce acreages from model outputs.
Kathy Mellander	Geographical information system specialist with M.S. in environmental science/hydrology and 20 years of experience. Provided map preparation.
Gary Pollock	Management assistant. B.S. in zoology with more than 25 years of experience. Provided project management and oversight, and served as airport liaison.
Suzy Schulman	Environmental planning and compliance specialist. B.S. in systems engineering, M.S. in environmental management, and 20 years of experience. Project manager until April 2007.
Robert Vogel	Deputy superintendent. B.S. in natural resource management and 30 years of experience. Provided project oversight and review.

Parsons	
Donald Beisel	Socioeconomist. B.S. and M.A. degrees in geography and 39 years of experience. Managed economic impacts modeling using the IMPLAN model and interpreted model results. Primary author of the “Socioeconomics” section.
Steve Coughlin	Environmental scientist. B.S. in meteorology and 26 years of experience. Conducted air quality modeling and assisted in interpretation of results.
Areg Gharabegian	Noise specialist. B.S. and M.S. degrees in mechanical engineering and 31 years of experience. Managed sound modeling using Integrated Noise Model 6.2a and interpreted model results.
Glenn Pacheco	Environmental scientist. B.S. in meteorology and 26 years of experience. Managed air quality modeling and interpreted model results.
Bruce Snyder	Environmental scientist. B.S. in biology, M.S. in wildlife biology, and 40 years of experience. Project manager for Parsons, oversaw document preparation, and primary author of numerous document sections and subsections.
Janet Snyder	Environmental scientist. B.S. in zoology and 35 years of experience. Primary writer and editor of the environmental impact statement.
Emery Tuttle	Noise specialist. Board-certified member of the Institute of Noise Control Engineering with 31 years of experience. Conducted sound modeling using Integrated Noise Model 6.2a.
Biota Research and Consulting, Inc.	
Thomas Campbell	Wildlife biologist. B.S. and M.S. degrees in wildlife biology with 29 years of professional experience. Managed wildlife biology, threatened and endangered species, and vegetation resource characterization and evaluation.
Jessica Mitchell	National Environmental Policy Act compliance specialist. B.S. degree in geography and environmental systems with 9 years of experience. Conducted wildlife, endangered and threatened species, and vegetation analyses.

LIST OF RECIPIENTS

Elected Officials

U.S. Senator John Barrasso
U.S. Senator Mike Enzi
Congresswoman Cynthia Lummis

Federal Agencies

Advisory Council on Historic Preservation
Greater Yellowstone Ecosystem Interagency Visitor Center
U.S. Army Corps of Engineers
U.S. Department of Agriculture, Bridger-Teton National Forest and Grand Targhee National Forest
U.S. Department of the Interior, Bureau of Land Management, State Office
U.S. Department of the Interior, Fish and Wildlife Service, Cheyenne Office
U.S. Department of the Interior, National Park Service, Intermountain Region Office
U.S. Department of the Interior, National Park Service, Yellowstone National Park
U.S. Department of the Interior, Office of Environmental Policy and Compliance
U.S. Department of the Interior, U.S. Fish and Wildlife Service, National Elk Refuge
U.S. Department of Transportation, Federal Aviation Administration
U.S. Environmental Protection Agency, Region 8 Office

Traditionally Associated Indian Tribes

Apache
Northern Arapaho
Blackfoot
Northern Cheyenne
Coeur d'Alene
Comanche
Crow
Gros Ventre
Kiowa
Nez Perce
Northern Paiute
Salish-Kootenai Group
Eastern Shoshone
Shoshone-Bannock
Assiniboine Sioux
Teton Sioux
Umatilla Group
Yakama Group

State and Local Agencies

Jackson Hole Airport
Mayor Mark Barron, Town of Jackson
Teton County Board of Commissioners
Teton County Library
Teton County Planning Office
Town of Jackson Administrator
Wyoming Department of Environmental Quality
Wyoming Department of State Parks and Cultural Resources - State Historic Preservation Office
Wyoming Department of Transportation
Wyoming Game and Fish Department
Wyoming Office of Federal Land Policy

Other Agencies and Organizations

American Alpine Club/Climbers Ranch
Defenders of the Rockies
Exum Mountain Guides
Grand Teton National Park Foundation
Grand Teton Natural History Association
Greater Yellowstone Coalition
Jackson Hole Conservation Alliance
Jackson Hole Historical Society
Jackson Hole Land Trust
Jackson Hole Mountain Guides
Jackson Hole Mountain Resort
National Parks Conservation Association
National Wildlife Foundation
Northern Rockies Conservation Cooperative
Teton Group of the Sierra Club
Teton Science Schools
The Nature Conservancy
The Wilderness Society
Trout Unlimited
Wild Earth
Wildlife Conservation Society
Wyoming Wildlife Federation
Yellowstone Association

Chapter 6
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GLOSSARY

Air carrier. For the purposes of this environmental impact statement, and based on classifications provided by The Boyd Group, Inc. (2007a), an air carrier is an aircraft with 60 to 188 passenger seats that transports passengers on routes according to regularly published schedules.

Audible. A sound that can be heard by a person with normal hearing.

Day-night average sound level. An energy-average sound level, including a nighttime penalty, that represents the total sound exposure over a specified period of time. Typically, a 24-hour period is used. The day-night average sound level was defined by the U.S. Environmental Protection Agency (1974) and has been adopted by several federal agencies as the standard for measuring community annoyance caused by aircraft sound. Because people are normally more sensitive to sound events at night, and the background sound levels are normally lower at night, a 10-decibel “penalty” is added to sound levels that occur during night hours, between 10:00 P.M. and 7:00 A.M. Therefore, one nighttime sound event is equivalent to 10 daytime events of the same level. The 24-hour average sound level, including this 10-decibel penalty, is known as the day-night average sound level (DNL). However, the 15 hours between 7 A.M. and 10 P.M. were used for this analysis to more accurately represent the hours of operations at the Jackson Hole Airport, where night operations are controlled by a voluntary curfew. Therefore, average sound level in this context does not include a 10-dBA nighttime penalty and is defined as a 15-hour Leq (sound level equivalent - see below).

Decibel (variously abbreviated as dB or db). A sound-level unit measured on a logarithmic scale. The “A-weighted” decibel scale (dBA) is a widely used weighting system that approximates how the human ear responds to sound levels. The "A-weighting" accounts for the fact that humans do not hear low frequencies and high frequencies as well as they hear middle frequencies, and it corrects for the relative efficiency of the human ear at the different frequencies. A logarithmic measure is used to cover efficiently the wide range of sound magnitudes encountered daily (source: Federal Aviation Administration 2006a).

DNL. See Day-night average sound level.

Enplanement. Each enplanement is one individual at an airport getting on an aircraft for a scheduled commercial flight. A round trip from, for example, Denver to Grand Teton National Park involves one enplanement at Denver International Airport and one enplanement at the Jackson Hole Airport.

Equivalent sound level. See Sound Equivalent Level.

Flight. Used interchangeably with operations, depending on context. A flight begins with a takeoff operation and concludes with a landing operation. Except for local general aviation, only one of these operations usually occurs at the Jackson Hole Airport.

General aviation. The category of civil aviation that encompasses all aircraft flights other than scheduled airline activity. It includes both private and commercial flights.

Instrument flight rules (IFR). A set of regulations of the U.S. Civil Aeronautics Board (in Civil Air Regulations) to govern the operational control of aircraft on instrument flight. IFR is popularly used to describe the weather and/or flight conditions to which these rules apply (source: amsglossary.allenpress.com/glossary/browse). These include weather situations at an airport during which a pilot must use instruments to assist takeoff and landing. IFR conditions for fixed-wing aircraft means the minimum cloud ceiling is greater than 500 feet and less than 1,000 feet and/or visibility is greater than 1 mile and less than 3 miles (source: www.weather.com/glossary/i.html). Compare to visual flight rules (VFR).

Instrumented airport. An airport that has electronic navigation equipment installed that enables pilots to make a landing approach using instruments. However, not all instrumented airports have instrument approaches that have been approved by the Federal Aviation Administration.

Ldn. See Day-night average sound level.

Lek. A location where males of the greater sage-grouse gather for competitive mating display. Leks are located on relatively open sites surrounded by sagebrush, or in areas where sagebrush density is low, such as exposed ridges, knolls, or grassy swales. In addition to natural openings, lek sites have involved many types of clearings and disturbed sites, including landing strips, old lake beds, roads, gravel pits, cropland, and burned areas (source: <http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Centrocercus+urophasianus> 2010).

Leq. See sound level equivalent.

Lmax. See maximum sound level.

Maximum Sound Level. The maximum sound level for a given time interval or event.

Natural Ambient Sound Level. The sound that exists in the absence of any human-produced sound.

Natural Soundscape: The combined sounds of nature that exist in the absence of human-made sounds, also sometimes called natural quiet. The natural soundscape, however, is not usually quiet, but includes all natural sound sources such as waterfalls, bird songs, thunder, and many other sounds of nature.

Noise. Unwanted or extraneous sound.

Operation. A takeoff or a landing. Every flight requires two operations, a takeoff and a landing. Depending on context, operation is used interchangeably with flight.

Percent-Time Audible. The percent of the total daytime period (7 A.M. to 10 P.M.) that the sound from aircraft that use the Jackson Hole Airport is audible.

Regional carrier. For the purposes of this environmental impact statement, and based on classifications provided by The Boyd Group, Inc. (2007a), a regional carrier is an aircraft with 30 to 86 passenger seats that transports passengers on routes according to regularly published schedules.

Sound exposure level. The sound exposure level (SEL) is the total sound energy of a single sound event that takes into account both its intensity and duration. Sound exposure level is the sound level that would be experienced if all of the sound energy of a sound event occurred in one second. This normalization to a duration of one second allows the direct comparison of sounds of different durations (source: Federal Aviation Administration 2006a).

Sound Level Equivalent (Leq): A single sound-pressure level over a given time that would have the same total energy of the actual varying sound levels. In this final environmental impact statement, a 15-hour Leq was modeled and reported. (For this analysis, Leq approximates a true, 24-hour DNL, but the Leq would not include sounds from aircraft operations that occurred between 10 P.M. and 7 A.M. and the associated 10 dBA-penalty assigned to each of these operations. This difference would result in DNL contours that were slightly larger than the equivalent Leq contours due to the relatively few nighttime operations. The airport's acoustic contractor, BridgeNet Solutions, Inc., has been calculating true DNLs based on airport operations each year since the mid 1980s. The 2005 DNL contours reported in the Jackson Hole Airport Board's annual report (2006) prepared by BridgeNet illustrate the similarity to the 15-hour Leq contours modeled of current conditions in this analysis.)

State 1, Stage 2, and Stage 3 aircraft. In 1977, the Federal Aviation Administration designated three stages of aircraft, based on sound level. For example, the Boeing 707 is a Stage 1 aircraft, the noisiest stage; the Boeing 727 and DC-9 are somewhat quieter Stage 2 planes; and the Boeing 767 is a relatively muted Stage 3 aircraft (source: <http://www.perc.org/perc.php?subsection=5&id=413>). Stage 3 aircraft, in general, are 10 decibels quieter than Stage 2 aircraft, which represents a halving of perceived sound. All aircraft greater than 75,000 pounds that were manufactured after January 1, 2000 had to meet Stage 3 standards (source: <http://www.massport.com/logan/airpo_noise_gloss.html>). With support from Congressional legislation, the Jackson Hole Airport banned the use of Stage 2 aircraft on June 28, 2004.

Time above 60 Decibels (TA60): The total time that sound levels from an aircraft related to operations at the Jackson Hole Airport are above 60 dBA. This is the sound level of a normal conversation at 5 feet, and a level that would likely cause speech interference.

Visual flight rules (VFR). A set of flight operating rules that assumes that the visibility is good enough to fly the airplane with visual reference to the horizon and to approach an airport by visual reference only (source: www.k-online.com/~esquared/alaska/aviation.htm). VFR criteria include a ceiling greater than 3,000 feet and visibility greater than 5 miles (source: www.weather.com/glossary/i.html). (Marginal visual flight rules or MVFR criteria include a ceiling between 1,000 and 3,000 feet and/or 3 to 5 miles visibility.) Compare to instrument flight rules (IFR).

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As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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