

CHAPTER 4

Environmental Consequences

Introduction

This chapter describes the methods and assumptions used to analyze impacts of the alternatives described in Chapter 2 and presents the results of the impact analyses. For each alternative, the direct, indirect, and cumulative environmental effects are analyzed for each impact topic presented in Chapter 3.

Methodology and Assumptions for Assessing Impacts

Analysis of the environmental consequences of the alternatives proposed in this document includes an examination of several factors for each resource, including type of impact, duration of impact, and context and intensity of impact. The discussion for each impact topic includes threshold definitions and an analysis of the impacts of each alternative, followed by an assessment of cumulative impacts and a conclusion.

The NPS assumed that the Final Plan/EIS would be in effect for the next 5 to 10 years, during which time there would be a slight to modest increase in visitation and a slight increase in traffic volumes. These assumptions are based on past visitor trends, which show relatively stable visitation numbers since 1993, even during years when the surrounding communities were experiencing a much higher growth rate. Traffic volume assumptions result from the visitation prediction. The NPS understands that several factors would affect visitation and traffic volumes, including general population growth, population growth in the states that contribute the most visitors to the Park, the general state of the economy (especially the cost of fuel), general demographics, and recreational preferences.

Type of Impact

Impacts can be beneficial or adverse, direct or indirect, or cumulative. Beneficial impacts are those that involve a positive change in the condition or appearance of a resource or a change that moves the resource toward a desired condition. Adverse impacts involve a change that moves the resource away from a desired condition or detracts from its appearance or condition. Direct impacts are caused by an action and occur at the same time and place as the action. Indirect impacts are caused by an action and occur later or farther away from the resource but are still reasonably foreseeable. Cumulative impacts

are the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

Context, Intensity, Duration

Impacts are described as to their context, intensity, and duration. Context generally refers to the geographic extent of impact (e.g., localized, widespread, or regional). In general, localized impacts have been described by relevant road segment for each alternative (i.e., south boundary to North Jenny Lake Junction, North Jenny Lake Junction to Colter Bay, and the Granite Canyon Entrance Station to Moose). Impact intensity is the magnitude or degree to which a resource would be beneficially or adversely affected. The thresholds used to assess intensity of impact for each resource topic are defined under each impact topic heading. Impact duration refers to how long an impact would last. For the purposes of this Final Plan/EIS, duration of the impact is also specified separately for each impact topic.

Area of Analysis

The area of analysis for impact assessment is defined separately for each impact topic and is identified at the end of the impact thresholds definitions for each topic. The area of analysis serves as the geographic basis for assessment of impacts resulting from the actions proposed under each alternative, as well as cumulative impacts, and includes areas surrounding the Park (as appropriate) for the topic discussed.

Cumulative Impacts

A cumulative impact is described in CEQ regulations (§1508.7) as “the impact on the environment that 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.” Cumulative impacts can result from individually minor, but collectively major, actions taking place over a period of time.

This analysis addressed the cumulative impacts of each alternative by considering the effects of the alternative combined with the effects of past, present, and reasonably foreseeable future actions identified in and around the project area. The methodology section for each topic identifies the area of analysis, which also applies to the cumulative analysis. Generally, this includes the front



country area of the Park; surrounding communities are also included for some topics. The NPS also identified projects occurring within the jurisdictional areas of Jackson and Teton Village through correspondence and phone calls with county and city governments and federal land managers. Projects include any planning or development activity that was currently being implemented or would be implemented in the reasonably foreseeable future that would contribute to cumulative impacts within the designated areas of analysis for this Final Plan/EIS. Appendix C provides a comprehensive list of such projects.

Impairment Analysis and Unacceptable Impacts

The NPS Management Policies (2001) require analysis of potential effects to determine whether actions would impair park resources. The fundamental purpose of the NPS, established by the Organic Act and reaffirmed by the General Authorities Act (as amended), begins with a mandate to conserve park resources and values. The NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values.

However, the laws do give the NPS the management discretion to allow impacts to park resources and values, when necessary and appropriate, to fulfill the purposes of a park as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the NPS management discretion to allow certain impacts within the Park, it limits that discretion by the statutory requirement that the NPS 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 Park Manager, would harm the integrity of park resources or values. An impact to any park resource or value would constitute impairment, but an impact would be more likely to constitute impairment to the extent that it has a major or severe adverse effect upon a resource or value, for which conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the Park.
- Key to the natural or cultural integrity of the Park.
- Identified as a goal in the Park's long-term planning or NPS planning documents.

An impact would be less likely to constitute impairment to the extent that it is an unavoidable result, which cannot be further mitigated, of an action necessary

to preserve or restore the integrity of park resources or values. Impairment would result from the NPS activities in managing the Park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the Park. This chapter includes a determination on impairment for all natural and cultural resource impact topics defined in Chapter 1. Impairment analysis and determinations are not required for visitor use and experience (unless the impact is resource-based), park operations, or socioeconomic environment (including economics, employment, housing, and land use).

Adverse impacts determined to have moderate or below (i.e., no impact, negligible, or minor) intensities are not analyzed further (relative to the impairment standard) because of their relatively low magnitude. All major adverse impacts are evaluated using the three-bulleted criteria above. Discussion of impairment is presented in the conclusion section for each impact topic.

The impact threshold at which impairment occurs is not always readily apparent. Therefore, the NPS will also avoid 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. Virtually every form of human activity that takes place within a park has some degree of effect on park resources or values; however, that does not mean the impact is unacceptable or that a particular use must be disallowed. Unacceptable impacts are impacts that, individually or cumulatively, would:

- Be inconsistent with a park's purposes or values.
- Impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the Park's planning process.
- Create an unsafe or unhealthy environment for visitors or employees.
- Diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values.
- Unreasonably interfere with park programs or activities; an appropriate use of the Park; the atmosphere of peace and tranquility; or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the Park.

In its role as steward of park resources, the NPS must ensure that acceptable park uses would not cause impairment of, or unacceptable impacts on, park resources and values. When proposed park uses and the protection



of park resources and values come into conflict, the protection of resources and values must be predominant. A new form of park use would be allowed within a park only after a determination has been made in the professional judgment of the Park Manager that it will not result in unacceptable impacts. The NPS will always consider allowing activities that are appropriate to the Park, although conditions would preclude certain activities or require that limitations be placed on them.

Visual and Scenic Quality

Methods and Assumptions

Locations of proposed pathway and shoulder improvements and locations of key viewpoints were identified, and view corridors were considered relative to these locations. Also considered was the length of time that an improvement would be seen by the viewer based on the width of the view corridor and the speed at which the viewer would be traveling.

Effects of Alternative 1 — No Action

Grand Teton National Park is world renowned for its spectacular scenery and views of the Teton Range, Jackson Hole, and native wildlife. Views of the Park from within developed areas, road corridors, parking areas, or other locations where development exists typically include some elements of that development; however, under Alternative 1, no additional development would occur in the various viewsheds. Separate entrance lanes would be constructed; however, these would lie in areas that are already developed and would not impact visual resources. Variable messaging

signs and improved signage for pedestrian and wildlife safety would be installed. These signs would be designed and sited in current transportation corridors to minimize their visual intrusion.

The NPS expects visitation to increase slightly over the next 5 to 10 years, resulting in slight increases in motor vehicle traffic. Consequently, views from along road corridors or parking areas could include additional vehicles, and parking areas and turnouts could become busier.

Recognizing the sensitivity of the area in terms of its wildlife and scenic values, the Park proposes to implement adaptive management strategies on the Moose-Wilson Road to help retain the road's existing character. Currently, the accumulation of dust on vegetation adversely affects some foreground views. Because proposed strategies would maintain approximately the same existing traffic volumes on the Moose-Wilson Road, the amount of dust would not likely increase. Overall, Alternative 1 would result in long-term, localized, negligible to minor, adverse impacts on visual quality.

Cumulative Impacts

Cumulative impacts to visual and scenic quality would include additional development and/or modification to the manmade environment undertaken to enhance visitor experience. Within the Park, these projects include construction of a new visitor center at Moose, replacement of the Moose Entrance Station, construction related to the LSR Preserve, upgrades to the Jenny Lake Lodge visitor accommodations and employee housing facilities, reconstruction and widening of North Park Road between Lizard Creek Campground and the South Entrance of

| Impact Threshold Definitions | |
|------------------------------|--|
| Negligible | Visitors would likely be unaware of any effects associated with implementation of the alternative. |
| Minor | Alterations in views would be slight but detectable, would affect few visitors, and would not appreciably limit or enhance visual resources identified as fundamental to the Park's purpose and significance. |
| Moderate | Many visitors would likely be aware of the effects associated with implementation of the alternative; some changes to visual resources identified as fundamental to the Park's purpose and significance would be apparent. |
| Major | Most visitors would be aware of the effects associated with implementation of the alternative; changes to visual resources identified as fundamental to the Park's purpose and significance would be readily apparent. |
| Duration | Short term — effects last 2 years or less. |
| | Long term — effects last longer than 2 years. |
| Area of Analysis | Travel routes and destinations within the Park boundary. |

Yellowstone, replacement of the Snake River Bridge near Flagg Ranch, and the chip-and-seal project from Moran to Jackson Lake Lodge.

These projects would result in short-term impacts on visual quality during periods of construction. Foreground views in localized areas could include construction equipment, fencing, stockpiled materials, and other intrusions into the natural setting. Construction-related visual impacts would be short term, localized, moderate, and adverse.

The impacts described under Alternative 1, combined with impacts of other actions that could affect visual and scenic quality within the Park, would result in long-term, localized, negligible to minor, adverse cumulative impacts to visual quality. Short-term, localized, moderate, adverse cumulative impacts would occur at locations of construction projects during the period of construction.

Conclusion

Alternative 1 would result in long-term, localized, negligible to minor, adverse effects on visual quality. Cumulative impacts would generally be long term, localized, negligible to minor, and adverse, with short-term, localized, moderate, adverse impacts occurring during brief periods of construction.

Because there would be no major, adverse impacts to visual and scenic quality, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's visual and scenic quality and no unacceptable impacts.

Effects of Alternative 2 — Improved Road Shoulders

In general, the effects of Alternative 2 on visual quality would be similar to those described for Alternative 1, with the exception that road shoulders would be improved to 5 ft (1.5 m) on the Teton Park Road between Moose and Signal Mountain Lodge. This alternative would result in the permanent removal of 13.3 acres (5.4 ha) of vegetation; however, this would occur in areas already disturbed by existing roads, and thus would have a minimal impact on visual resources. In addition, informational kiosks, improved signage for pedestrian and wildlife safety, and six variable messaging signs would be installed in several locations. However, these would be designed and sited to minimize their visual intrusion. Separate entrance lanes would be constructed that lie in areas that are already developed,

and therefore would not impact visual resources. Limiting motorized traffic along Signal Mountain Road would improve the scenic quality along the road for non-motorized users.

Construction of the shoulder improvements, separate entrance lanes, and kiosks or additional signs would result in short-term impacts on visual resources during construction. Visitors would be aware of construction equipment, fencing, stockpiled materials, and other intrusions into the natural setting. Because weather conditions in the Park may preclude staging construction during less-busy seasons, and because some of these areas would be difficult to make inaccessible to visitors while construction is underway, construction-related visual impacts would be short term, localized, moderate, and adverse to the affected road corridor, and would affect both visitors and employees. Long-term effects on visual quality from Alternative 2 would be localized, negligible to minor, and adverse.

Cumulative Impacts

Cumulative impacts under Alternative 2 would be essentially the same as those described for Alternative 1. Overall, the impacts of these related actions, in conjunction with the impacts of Alternative 2, would result in negligible to minor, long-term, adverse cumulative impacts to visual quality within the Park. Moderate, short-term, adverse cumulative impacts to visual resources would occur at the locations of construction projects, during the construction period, and for up to a 1-year recovery period following construction.

Conclusion

Alternative 2 would result in long-term, localized, negligible to minor, adverse impacts on visual quality, with short-term, localized, moderate, adverse impacts during construction of improved shoulders. Cumulative impacts would generally be long term, negligible to minor, and adverse, with short-term, moderate, adverse impacts occurring during periods of construction.

Because there would be no major adverse impacts to visual and scenic quality, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's visual and scenic quality and no unacceptable impacts.



Effects of Alternative 3 — Improved Road Shoulders / Multi-Use Pathways

The 23.3 miles (37.3 km) of multi-use pathways outside the road corridor (i.e., 9.4 miles [15.0 km]) from the south boundary to Antelope Flats Road, 10.6 miles [17.0 km] from Moose Junction to North Jenny Lake Junction, and 3.3 miles [5.3 km] from the Granite Canyon Entrance Station to the LSR Preserve) under this alternative would be a new feature, intruding into the foreground views as seen from the affected road corridors, and would be visible by motorists most of the time.

Under this alternative, 5,200 to 7,100 trees in total would be removed and 63.8 acres (25.8 ha) of vegetation permanently removed. The effects from the south boundary to North Jenny Lake Junction would be minor because the views in this area are mainly of the forested areas in the distance and the high peaks of the Teton Mountains.

Construction of a multi-use pathway along a portion of the Moose-Wilson Road could require the removal of 2,925 to 3,725 trees, depending on the specific design, and could alter the existing character of the road corridor where the views are of the foreground rather than distant vistas. Although the pathway would be designed and sited to minimize tree removal and impacts on the visual quality of the area, the new development introduced into the view corridor and the change in character of the views would be obvious to most visitors resulting in moderate to major adverse impacts depending on distance of the pathway from the road.

Improving the shoulder between North Jenny Lake Junction and Colter Bay (15.5 miles [25.0 km]) would also affect visual resources, but to a lesser degree (negligible to minor effects) than pathways because improvements would occur in a previously disturbed area immediately adjacent to the existing road.

The Moose-Wilson Road would be realigned in two areas and the existing alignments would be abandoned and restored to natural conditions. Pavement would be removed, and the roadbed would be regraded and revegetated with the intention of restoring aspen and wetland habitat in this area. The aspen, cottonwood, and mixed deciduous-coniferous forests and wetlands located along this section of the Moose-Wilson Road provide unique habitat for wildlife and distinct vegetative communities. The area to be restored differs importantly from the surroundings, and the road passing through it currently affects its wildlife habitat value. Concurrent to the restoration, two new segments of road would be constructed to replace the sections being

removed, primarily in areas of sagebrush meadow. The new construction would introduce development onto alignments that are not currently developed, but which are near other development (i.e., nearby structures, power lines, other roads). Overall, realignment of the road would result in a change in the viewshed, but the long-term net effect would be localized, minor, and could be considered either beneficial or adverse depending on the point of view of the observer.

Formalizing social trails would reduce resource impacts in non-designated areas and improve visual resources. Other elements of Alternative 3, including the construction of separate entrance lanes and installation of signage for pedestrian and wildlife safety, variable messaging signs, and informational kiosks, would have impacts on visual quality similar to those described in Alternative 2. Overall, actions under Alternative 3 would result in long-term, localized, minor to moderate, adverse impacts on visual quality.

Cumulative Impacts

Cumulative impacts under Alternative 3 would be similar to those described for Alternative 2 but with the added impacts of the pathways and realignment of the Moose-Wilson Road. Overall, the impacts of these related actions, in conjunction with the impacts of Alternative 3, would result in long-term, minor to moderate, adverse cumulative impacts to visual quality within the Park. Short-term, moderate, adverse cumulative impacts to visual resources would occur at the locations of construction projects, during the construction period, and for up to a 1-year recovery period following construction.

Conclusion

Alternative 3 would result in long-term, localized, minor to moderate, adverse impacts on visual quality, primarily because of the introduction of multi-use pathways into the foreground views, as seen from the affected road corridors. Improving the shoulder between North Jenny Lake Junction and Colter Bay and realignment of the Moose-Wilson Road would also contribute to the adverse impacts but to a lesser degree. Short-term, localized, moderate, adverse impacts would result during realignment and construction of improved shoulders and pathways. Cumulative impacts would be long term, minor to moderate, and adverse, with short-term, moderate, adverse impacts during periods of construction.

Because there would be no major, adverse impacts to visual and scenic quality, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the

natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's visual and scenic quality and no unacceptable impacts.

Effects of Alternative 3a — Preferred Alternative

The 22.5 miles (36.0 km) of multi-use pathways outside the road corridor (i.e., 9.4 miles [15.0 km]) from the south boundary to Antelope Flats Road, 10.6 miles [17.0 km] from Moose Junction to North Jenny Lake Junction, 1.5 miles [2.4 km] from North Jenny Lake Junction to String Lake, and 1.0 mile [1.6 km] on Sagebrush Drive and Spring Gulch Road) and the 18.8 miles (30.3 km) of multi-use pathways within the road corridor (i.e., 15.5 miles [25.0 km] from North Jenny Lake Junction to Colter Bay and 3.3 miles [5.3 km] from the Granite Canyon Entrance Station to the LSR Preserve) under this alternative would be a new feature intruding into the foreground views, as seen from the affected road corridors, and would be visible by motorists most of the time.

From the south boundary to North Jenny Lake Junction, the effects from construction of multi-use pathways outside the road corridor would be minor because the views in this area are mainly of the forested areas in the distance and the high peaks of the Teton Mountains. Pathway spurs are proposed in two areas along this segment: North Jenny Lake Junction to String Lake and along Sagebrush Drive and Spring Gulch Road. While impacts to visual resources in these areas would be greater than under Alternative 3, the effects would still be minor.

Construction of multi-use pathways within the road corridor between North Jenny Lake Junction and Colter Bay (15.5 miles [25.0 km]) would have moderate effects on visual resources because of the vegetation removal required in this area. In addition, due to the terrain, pathway construction in this area would require cut and fill actions and retaining walls and guardrails could possibly be installed.

Construction of a multi-use pathway within the road corridor along a portion of the Moose-Wilson Road could require the removal of 2,150 to 2,900 trees, depending on the specific design, and could alter the existing character of the road corridor where the views are of the foreground rather than distant vistas. Although the pathway would be designed and sited to minimize tree removal and impacts on the visual quality of the area, the new development introduced into the view corridor and the change in character of the views would be obvious to most visitors, resulting in moderate to major adverse impacts.

Under this alternative, 17,900 to 23,075 trees in total would be removed and 82.9 acres (33.5 ha) of vegetation permanently removed. Overall, these actions would result in long-term, localized, moderate, adverse impacts on visual quality.

Effects to visual resources from formalizing social trails and realignment of the Moose-Wilson Road would be the same as those described for Alternative 3. Other elements of Alternative 3a, including the construction of separate entrance lanes and installation of signage for pedestrian and wildlife safety, variable messaging signs, and informational kiosks, would have impacts on visual quality similar to that described in Alternative 2.

Cumulative Impacts

Cumulative impacts under Alternative 3a would be essentially the same as those described for Alternative 3 but with the added adverse impacts of the more extensive pathway system, especially in forested areas. Overall, the impacts of these related actions, in conjunction with the impacts of Alternative 3a, would result in long-term, moderate to major, adverse cumulative impacts to visual quality within the Park. Short-term, moderate, adverse cumulative impacts to visual resources would occur at the locations of construction projects, during the construction period, and for up to a 1-year recovery period following construction.

Conclusion

Alternative 3a would result in long-term, localized, moderate, adverse impacts on visual quality, largely because of the introduction of multi-use pathways into the foreground views, as seen from the affected road corridors. Short-term, localized, moderate, adverse impacts would result during construction. Cumulative impacts would be long term, minor to major, and adverse, with short-term, moderate, adverse impacts from construction activities.

The main differences between Alternatives 3 and 3a are as follows: Under Alternative 3a, pathway spurs are proposed in two areas (North Jenny Lake Junction to String Lake and along Sagebrush Drive and the Spring Gulch Road), and a pathway inside the road corridor would be constructed rather than improving the shoulder from North Jenny Lake Junction to Colter Bay. Impacts to visual resources in these areas would be greater under Alternative 3a.

Because there would be no major, adverse impacts to visual and scenic quality, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the



natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's visual and scenic quality and no unacceptable impacts.

Effects of Alternative 4 — Multi-Use Pathways

The 42.6 miles (68.4 km) of multi-use pathways outside the road corridor would be a new feature intruding into the foreground views, as seen from the affected road corridors, and would be visible by motorists most of the time.

From the south boundary to North Jenny Lake Junction, the effects from construction of multi-use pathways outside the road corridor would be minor because the views along this segment are mainly of the areas in the distance and the high peaks of the Teton Mountains. Construction of multi-use pathways outside the road corridor between North Jenny Lake Junction and Colter Bay would have moderate effects on visual resources because of the vegetation removal required in this area. Although the pathway would be designed and sited to minimize tree removal and impacts on the visual quality of the area, the new development introduced into the view corridor would be obvious to most visitors depending on the distance of the pathway from the road (moderate adverse impacts). Along this segment, 21,725 to 23,550 trees would be removed and 28.0 acres (11.3 ha) would be permanently disturbed.

Construction of a multi-use pathway outside the road corridor along the entire the Moose-Wilson Road could require the removal of 6,375 to 7,575 trees, depending on the specific design, and could alter the existing character of the road corridor where the views are of the foreground rather than distant vistas. Although the pathway would be designed and sited to minimize tree removal and impacts on the visual quality of the area, the new development introduced into the view corridor and the change in character of the views would be obvious to most visitors depending on the distance of the pathway from the road resulting in moderate to major adverse impacts.

Under this alternative, 29,950 to 33,775 trees in total would be removed and 85.1 acres (34.4 ha) of vegetation permanently removed. This would result in long-term, localized, moderate to major, adverse impacts on visual quality.

Effects to visual resources from formalizing social trails and realignment of the Moose-Wilson Road would be similar to those described for Alternative 3 but greater than those for Alternative 3a. Other elements of Alternative 4,

including the construction of separate entrance lanes and installation of signage for pedestrian and wildlife safety, variable messaging signs, and informational kiosks, would have impacts on visual quality similar to that described in Alternative 2.

Cumulative Impacts

Cumulative impacts under Alternative 4 would be essentially the same as those described for Alternative 3 but with the added adverse impacts of the more extensive pathway system outside the road corridor, especially in forested areas (North Jenny Lake to Colter Bay and along the entire the Moose-Wilson Road). The impacts of these related actions, in conjunction with the impacts of Alternative 4, would result in long-term, moderate to major, adverse cumulative impacts to visual quality within the Park. Short-term, moderate, adverse cumulative impacts to visual resources would occur at the locations of construction projects, during the construction period, and for up to a 1-year recovery period following construction.

Conclusion

Alternative 4 would result in long-term, localized, moderate to major, adverse impacts on visual quality, largely because of the introduction of multi-use pathways into the foreground views, as seen from the affected road corridors. Short-term, localized, moderate, adverse impacts would result during construction. Cumulative impacts would be long term, minor to major, and adverse, with short-term, moderate, adverse impacts from construction activities.

The main differences between Alternative 3a and Alternative 4 are as follows: Alternative 4 includes the construction of multi-use pathways outside the road corridor rather than within the road corridor from North Jenny Lake Junction to Colter Bay, and construction of multi-use pathways outside the road corridor along the entire the Moose-Wilson Road rather than just to the LSR Preserve, as proposed under Alternative 3a. In addition, the pathway spurs to String Lake and along Sagebrush Drive and Spring Gulch Road would not be constructed under Alternative 4.

Because there would be no major, adverse impacts to visual and scenic quality, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's visual and scenic quality and no unacceptable impacts.

Soils

Methods and Assumptions

Five measures of soils impact are considered in this analysis: soil removal, soil compaction, soil restoration, erosion, and the area of disturbance relative to the area of analysis (i.e., Grand Teton National Park). Activities that may result in impact to soils include improving shoulders, road realignment, and pathways construction.

Impacts to soils were assessed by examining the soils information and mapping for Grand Teton National Park (see Chapter 3). Disturbances were estimated based on the length and estimated width of the proposed pathways or shoulders in each area transected. Impacts from improved road shoulders were estimated by applying an estimated 5-ft (1.5-m) width of permanent vegetation disturbance and a 5-ft (1.5-m) width of temporary construction-related disturbance (i.e., extension of existing shoulders on both sides). Impacts from construction of multi-use pathways were estimated by applying a 14-ft (4.2-m) width of permanent vegetation disturbance plus a 14-ft (4.2-m) width of temporary, construction-related disturbance (i.e., heavy machinery use, grading, or stockpiling) per pathway. The pathways are designed to mitigate soil erosion due to runoff with the inclusion of 2-ft gravel sections on each side of the paved pathway. In all cases, precise pathway locations and exact specifications have not been determined. As a result, some amount of error in disturbance estimates is expected.

Effects of Alternative 1 — No Action

Under Alternative 1, there would be no direct impacts to soils from construction of multi-use pathways or improved road shoulders. However, there would be continued impacts to soils where visitors pull off roadways or parking lots onto adjacent unpaved areas or create social trails. Continued road maintenance may also result in a small loss of soils if repairs or widening occurs adjacent to the existing roadbed, and some impacts to soils could occur from creation of separate entrance lanes. These activities would result in soil compaction and associated loss of productivity along roadways and at the developed activity areas. For example, an extensive social trail network has developed at South Jenny Lake. Compaction also occurs because of vehicles parking on the entry drive shoulder, especially during the popular summer months. An extensive social trail network is also apparent at Colter Bay. Alternative 1 would include installation of roadside variable messaging signs and signage for pedestrian and wildlife safety at locations within and outside the Park. These signs would be located on existing disturbed grounds at roadway shoulders and major intersections, and thus would involve no additional permanent disturbance.

Continued short- and long-term, localized, adverse impacts would be negligible to minor because these impacts would be limited to relatively small and often previously disturbed areas.

| Impact Threshold Definitions | |
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| Negligible | Soils would not be affected or the effects to soils would be below or at the lower levels of detection. Any effects to soil productivity or fertility would be slight. |
| Minor | The effects to soils would be detectable. Effects to soil productivity or fertility would be relatively small, as would the area affected. If mitigation were needed to offset adverse effects, it would be relatively simple to implement and likely successful. |
| Moderate | The effect on soil productivity or fertility would be readily apparent and result in a change to the soil character over a relatively wide area. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful. |
| Major | The effect on soil productivity or fertility would be readily apparent and would substantially change the character of the soils over a large area in and outside of the Park. Mitigation measures to offset adverse effects would be needed and would be extensive; their success could not be guaranteed. |
| Duration | Short term — recovers in less than 3 years. |
| | Long term — requires more than 3 years to recover. |
| Area of Analysis | Within park boundary. |



Cumulative Impacts

Recent, current, and planned projects within Grand Teton National Park have the potential to adversely impact soils. These projects include construction of a new visitor center at Moose, replacement of the Moose Entrance Station, construction of the LSR Preserve, rehabilitation of the White Grass Ranch infrastructure, upgrades to the Jenny Lake Lodge visitor accommodations and employee housing facilities, reconstruction and widening of North Park Road between Lizard Creek Campground and the South Entrance of Yellowstone, replacement of the Snake River Bridge near Flagg Ranch, and the chip-and-seal project from Moran to Jackson Lake Lodge. All of these developments would occur in areas where human activities are already concentrated, thus minimizing impacts to soils in previously undisturbed areas. Furthermore, all work would be done using mitigation measures that call for preservation of topsoil and reclamation of disturbed areas with native vegetation. Widening North Park Road would result in the permanent loss of approximately 33 acres (13 ha) of soils along an existing road corridor within the Park. All construction would incorporate mitigation measures to preserve soils and provide for soil and vegetation reclamation.

The impacts of these related actions, in conjunction with the impacts of Alternative 1, would result in negligible to minor, long-term, adverse cumulative impacts to soils within the Park. Alternative 1 would contribute a negligible increment to the overall cumulative impact.

Conclusion

Alternative 1 would result in short- and long-term, localized, negligible to minor, adverse impacts on soils due to the continued use of social trails and illegal off-road parking. Cumulative impacts would be long term, negligible to minor, and adverse.

Because there would be no major, adverse impacts to soils, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's soil resources and no unacceptable impacts.

Effects of Alternative 2 — Improved Road Shoulders

Under Alternative 2, impacts to soils would occur from the same causes as described for Alternative 1, including continued off-road parking and use of social trails,

occasional road maintenance, and construction of separate entrance lanes, with resultant short- and long-term, localized, minor, adverse impacts. Alternative 2 would also include direct and adverse impacts relating to improving shoulders along approximately 17.8 miles (28.6 km) of the Teton Park Road to 5 ft (1.5 m) from Moose Junction to Signal Mountain Lodge. The improvement of road shoulders along the Teton Park Road would permanently remove approximately 13.3 acres (5.4 ha) of primarily gravelly loam soils and cause temporary disturbance of another 13.3 acres (5.4 ha) where construction equipment would be used adjacent to the main work area. Impacts would be short term, localized, adverse, and minor because impacts would not affect a wide area of the Park and areas bordering the shoulders would be revegetated.

Visitor information kiosks would be installed within activity areas on existing disturbed ground and would not result in new net disturbances. Alternative 2 would also include installation of improved signage for pedestrian and wildlife safety and six roadside variable messaging signs at locations within and outside the Park. These signs would also be located on existing disturbed grounds at roadway shoulders and major intersections, and thus would involve no additional permanent disturbance.

Cumulative Impacts

Recent, current, and planned projects within Grand Teton National Park that would adversely impact soils described under Alternative 1 would also apply to Alternative 2. Overall, impacts of these actions (in conjunction with impacts of Alternative 2) would result in long-term, negligible to minor, adverse impacts to soils within the Park. Alternative 2 would contribute only a negligible amount to overall cumulative impacts.

Conclusion

Alternative 2 would result in short- and long-term, localized, minor, adverse impacts to soils due to continued use of social trails, illegal off-road parking, and construction of improved shoulders along a portion of the Teton Park Road. Cumulative impacts would be long term, negligible to minor, and adverse.

Because there would be no major, adverse impacts to soils, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's soil resources and no unacceptable impacts.

Effects of Alternative 3 — Improved Road Shoulders / Multi-Use Pathways

Actions proposed under Alternative 3 would reduce the use of off-road parking and creation of social trails near roadways that have been causing long-term, negligible to minor, adverse impacts to soils in localized areas around the Park. The construction of multi-use pathways and improved shoulders and improvement of selected social trails in developed areas would result in a permanent loss of soils; however, because these areas have already been disturbed, new impacts would be limited.

Construction of multi-use pathways outside the road corridor along approximately 23.3 miles (37.3 km) of roads would permanently remove soils (approximately 63.8 acres [25.8 ha], mainly gravelly loam) and cause temporary disturbance to approximately 63.8 additional acres (25.8 ha). Overall, 5,200 to 7,100 trees would be removed under this alternative.

From the south boundary to North Jenny Lake Junction, the effects to soils from pathway construction outside the road corridor would be minor. The majority of this area is relatively flat and is comprised of mainly shrub cover type; therefore, erosion from the site is expected to be low. Construction of a multi-use pathway along a portion of the Moose-Wilson Road could require the removal of 2,150 to 2,900 trees, depending on the specific design, and could result in increased soil erosion in some areas, resulting in minor to moderate effects.

Improving road shoulders along the Teton Park Road and North Park Road between North Jenny Lake Junction and Colter Bay (15.5 miles [25.0 km]) would permanently remove approximately 4.1 acres (1.7 ha) of gravelly loam soils and cause temporary disturbance of another 4.1 acres (1.7 ha) where construction equipment would be used adjacent to the main work area. Effects to soils would be minor and less than pathway construction in this area because construction disturbance would occur in a previously disturbed area immediately adjacent to the existing road.

The Moose-Wilson Road would be realigned in two areas and the existing alignments would be abandoned and restored to natural conditions. Pavement would be removed and the roadbed would be regraded and revegetated with the intention of restoring aspen and wetland habitat in this area. This would result in the restoration of approximately 5.0 acres (2.0 ha) of soils along the abandoned road alignment (where pavement

would be removed and the area graded and reseeded). Approximately 3.9 acres (1.6 ha) of soils would be redisturbed along the new alignment, which follows an old roadbed. In the long term, restoration of habitat in this area would result in negligible to minor, localized, beneficial impacts to soil resources.

Separate entrance lanes would be constructed in areas that are already developed, and therefore would result in minor impacts during construction. Visitor information kiosks would be installed within activity areas on existing disturbed ground and would not result in new net disturbance. Alternative 3 would also include installation of improved signage for pedestrian and wildlife safety and six roadside variable messaging signs at locations within and outside the Park. These signs would also be located on existing disturbed grounds at roadway shoulders and major intersections, and thus would involve no additional permanent disturbance.

Creation of the pathway system would discourage social trail development, and information at kiosks and additional signs would direct visitors to stay on designated routes. However, creation of such a pathway system could also result in additional social trails in areas where views or wildlife are outstanding. Interpretive exhibits would be installed in these areas to call attention to the resource and remind visitors to stay on the designated pathway.

Long-term, localized, negligible, beneficial impacts are expected to result from visitors using established pathways. However, the creation of the paved pathways and shoulders would result in direct, long-term, localized, moderate, adverse impacts confined to areas of multi-use pathway development, which would be located in relatively undisturbed areas off the main roadways. Short-term, localized, minor, adverse impacts would occur where construction disturbs soils, which would then be reclaimed and revegetated. Long-term adverse impacts in these areas would be negligible.

Cumulative Impacts

Recent, current, and planned projects within Grand Teton National Park that would adversely impact soils would be the same as for Alternative 1. The impacts of these related actions, in conjunction with the impacts of Alternative 3, would result in long-term, minor to moderate, adverse cumulative impacts to soils within the Park. Alternative 3 would contribute only a small amount to overall cumulative impacts.



Conclusion

Alternative 3 would result in short- and long-term, localized, minor to moderate, adverse impacts to soils, as well as long-term, localized, negligible, beneficial impacts to soils, primarily because of the construction and eventual use of a multi-use pathway system and improved road shoulders, as well as the improvements and delineation of social trails. Short-term, localized, minor, adverse impacts would occur at locations of construction projects. Cumulative impacts would be long term, minor to moderate, and adverse.

Because there would be no major, adverse impacts to soils, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's soil resources and no unacceptable impacts.

Effects of Alternative 3a — Preferred Alternative

Actions proposed under Alternative 3a would reduce the use of off-road parking and creation of social trails near roadways that have been causing negligible to minor, long-term, adverse impacts to soils in localized areas around the Park. The construction of multi-use pathways and improvement of selected social trails in developed areas would result in a permanent loss of soils; however, since these areas have already been disturbed, new impacts would be limited.

The main differences between Alternative 3 and Alternative 3a are as follows: Alternative 3a includes the addition of pathway spurs in two areas (North Jenny Lake Junction to String Lake and along Sagebrush Road and Spring Gulch Drive), construction of a pathway within the road corridor rather than a widened shoulder from North Jenny Lake Junction to Colter Bay, and construction of a pathway within the road corridor along a portion of the Moose-Wilson Road rather than outside the road corridor.

Construction of multi-use pathways outside the road corridor (along approximately 22.5 miles [36.0 km]) and pathways within the road corridor (along approximately 18.8 miles [30.3 km]) would be a new feature and would permanently remove soils (approximately 76.0 acres [31.0 ha], mainly gravelly loam) and cause temporary disturbance to approximately 76.0 additional acres (31.0 ha). Overall, 17,900 to 23,075 trees would be removed under Alternative 3a.

From the south boundary to North Jenny Lake Junction, the effects from construction of multi-use pathways outside the road corridor would be the same as described for Alternative 3 (i.e., minor and localized), except for the two pathway spurs. The spurs are proposed in two areas along this segment: North Jenny Lake Junction to String Lake and along Sagebrush Drive and the Spring Gulch Road. While impacts to soils in these areas would be greater than under Alternative 3, the overall effects would still be minor and localized.

Construction of road features and pathways within the road corridor between North Jenny Lake Junction and Colter Bay (15.5 miles [25.0 km]) would have moderate localized effects on soils because of construction within the road corridor. Due to the terrain, pathway construction in this area would require cut and fill actions and retaining walls could possibly need to be installed. In addition, some degree of vegetation removal within the road corridor would likely be required in this area that could result in increased soil erosion. Widening and construction of paths in this section would permanently remove approximately 25.0 acres (10.0 ha) of gravelly loam soils and cause temporary disturbance of another 25.0 acres (10.0 ha) where construction equipment would be used adjacent to the main work area.

Construction of a multi-use pathway within the road corridor along a portion of the Moose-Wilson Road could require the removal of 2,150 to 2,900 trees, depending on the specific design, and could affect soils. Less vegetation removal would be required than under Alternative 3 because the pathway would be constructed within rather than outside the road corridor. Although the pathway would be designed and sited to minimize effects, soil disturbance would occur and could result in soil erosion in some areas. Adverse effects are expected to be short term, minor and localized.

Similar to Alternative 3, the north end of the Moose-Wilson Road would be realigned in two locations: (1) from one-third mile north of Death Canyon Road to Sawmill Pond Overlook and (2) in the vicinity of the junction with the Teton Park Road. This would result in the restoration of approximately 5.0 acres (2.0 ha) of soils along the abandoned road alignment, where pavement would be removed and the area graded and reseeded. Approximately 3.9 acres (1.6 ha) of soils would be redisturbed along the new alignment, which follows an old roadbed. In the long term, restoration of habitat in this area would result in localized, negligible to minor, beneficial impacts to soil resources.

Separate entrance lanes would be constructed in areas that are already developed, and therefore would result in minor impacts during construction. Visitor information kiosks, improved signage for pedestrian and wildlife safety, and six roadside variable messaging signs would be located as in Alternative 3, and thus would involve no additional permanent disturbance. Creation of the pathway system would discourage social trail development, and information at kiosks and additional signs would direct visitors to stay on designated routes. However, creation of such a separated pathway system could also result in additional social trails in areas where views or wildlife are outstanding. Interpretive exhibits would be installed in these areas to call attention to the resource and remind visitors to stay on the designated pathway.

Long-term, localized, negligible, beneficial impacts are expected to result from visitors using established pathways. However, creation of the pathways and shoulders would result in direct, short- and long-term, localized, moderate, adverse impacts, confined to areas of multi-use pathway development, which would be located in relatively undisturbed areas off the main roadways. Short-term, localized, minor, adverse impacts would occur where construction disturbs soils, which would then be reclaimed and revegetated. Long-term adverse impacts in these areas would be negligible.

Cumulative Impacts

Recent, current, and planned projects within Grand Teton National Park that would adversely impact soils would be the same as for Alternative 1. The impacts of these related actions, in conjunction with the impacts of Alternative 3a, would result in long-term, minor to moderate, adverse cumulative impacts to soils within the Park. Alternative 3a would contribute a moderate amount to overall cumulative impacts.

Conclusion

Alternative 3a would result in short- and long-term, localized, moderate, adverse impacts to soils, as well as long-term, localized, negligible, beneficial impacts to soils, primarily because of the construction and eventual use of a multi-use pathways system, as well as the improvements to and delineation of social trails. Short-term, localized, minor, adverse impacts would occur at locations of construction projects. Cumulative impacts would be long term, minor to moderate, and adverse.

Because there would be no major, adverse impacts to soils, for which conservation is (1) necessary to fulfill specific

purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's soil resources and no unacceptable impacts.

Effects of Alternative 4 — Multi-Use Pathways

Actions proposed under Alternative 4 would reduce the use of off-road parking or creation of social trails near roadways that have been causing negligible to minor, long-term, adverse impacts to soils in localized areas around the Park. The construction of multi-use pathways and improvement of selected social trails in developed areas would result in a permanent loss of soils; however, because these areas have already been disturbed, new impacts would be limited.

The main differences between Alternative 3a and Alternative 4 are as follows: Alternative 4 includes the construction of multi-use pathways outside the road corridor rather than within the road corridor from North Jenny Lake Junction to Colter Bay, and construction of multi-use pathways outside the road corridor along the entire the Moose-Wilson Road rather than just to the LSR Preserve. In addition, the pathway spurs to String Lake and along Sagebrush Road and Spring Gulch Drive would not be constructed under Alternative 4.

Construction of multi-use pathways outside the road corridor along approximately 42.6 miles (68.4 km) of roads would be a new feature and would permanently remove soils (approximately 81.0 acres [33.0 ha], mainly gravelly loam) and cause temporary disturbance to approximately 81.0 additional acres (33.0 ha). Under this alternative, 29,950 to 33,775 trees would also be removed, compared to a range of 17,900 to 23,075 under Alternative 3a, and 5,200 to 7,100 under Alternative 3.

From the south boundary to North Jenny Lake Junction, the effects from construction of multi-use pathways outside the road corridor would be the same as for Alternative 3 (i.e., minor and localized). Construction of multi-use pathways outside the road corridor between North Jenny Lake Junction and Colter Bay would have moderate localized effects on soils because of the potential for removal of large amounts of vegetation in this area that could lead to soil erosion. Construction of improved road shoulders between Signal Mountain Lodge and Jackson Lake Dam (2.0 miles [3.2 km]) would permanently remove



approximately 0.9 acres (0.4 ha) of gravelly loam soils and cause temporary disturbance of another 0.9 acres (0.4 ha) where construction equipment would be used adjacent to the main work area. Although a greater number of acres of vegetation would be impacted on this section (i.e., North Jenny Lake Junction to Colter Bay) under Alternative 4 than either Alternatives 3 or 3a, less soil disturbance would occur compared to Alternative 3a because far less cut and fill would be required with construction of multi-use pathways outside the road corridor.

Construction of a multi-use pathway outside the road corridor along the entire the Moose-Wilson Road could require the removal of 6,375 to 7,525 trees, depending on the specific design, and could result in increased soil erosion in some areas, resulting in minor to moderate effects.

Similar to Alternatives 3 and 3a, the north end of the Moose-Wilson Road would be realigned in two locations: (1) from one-third mile north of Death Canyon Road to Sawmill Pond Overlook and (2) in the vicinity of the junction with the Teton Park Road. This would result in the restoration of approximately 5.0 acres (2.0 ha) of soils along the abandoned road alignment, where pavement would be removed and the area graded and reseeded. Approximately 3.9 acres (1.6 ha) of soils would be redisturbed along the new alignment, which follows an old roadbed. In the long term, restoration of habitat in this area would result in localized, negligible to minor, beneficial impacts to soil resources.

Separate entrance lanes for the Moose Entrance Station would be constructed in areas that are already developed, and therefore would result in minor impacts during construction. Visitor information kiosks, improved signage for pedestrian and wildlife safety, and six roadside variable messaging signs would be located as in Alternatives 3 and 3a, and thus would involve no additional permanent disturbance. Creation of the pathway system would discourage social trail development, and information at kiosks and additional signs would direct visitors to stay on designated routes. However, creation of such a separated pathway system could also result in additional social trails in areas where views or wildlife are outstanding. Interpretive exhibits would be installed in these areas to call attention to the resource and remind visitors to stay on the designated pathway.

Long-term, localized, negligible, beneficial impacts are expected to result from visitors using established pathways. However, creation of multi-use pathways and improved shoulders would result in direct, long-term, localized,

moderate, adverse impacts, confined to areas of multi-use pathway development, which would be located in relatively undisturbed areas off the main roadways. Short-term, localized, minor, adverse impacts would occur where construction disturbs soils, which would then be reclaimed and revegetated. Long-term, adverse impacts in these areas would be negligible.

Cumulative Impacts

Recent, current, and planned projects within Grand Teton National Park that would adversely impact soils would be the same as for Alternative 1. The impacts of these related actions, in conjunction with the impacts of Alternative 4, would result in long-term, minor to moderate, adverse cumulative impacts to soils within the Park. Alternative 4 would contribute a moderate amount to overall cumulative impacts.

Conclusion

Alternative 4 would result in long-term, localized, moderate, adverse impacts to soils, as well as long-term, localized, negligible, beneficial impacts to soils, primarily because of the construction and eventual use of a multi-use pathways system, as well as the improvements to and delineation of social trails. Short-term, localized, minor, adverse impacts would occur at locations of construction projects. Cumulative impacts would be long term, minor to moderate, and adverse.

Because there would be no major, adverse impacts to soils, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's soil resources and no unacceptable impacts.

Vegetation (including Plant Species of Special Concern)

Methods and Assumptions

Vegetation impacts considered in this analysis include loss of native vegetation permanently removed because of transportation infrastructure construction and maintenance, as well as the expected expansion of weed populations and associated weed control and monitoring along new pathways. In addition, impacts to plant species of special concern are addressed in this section.

Impacts to vegetative cover types were assessed using the same general approach as applied to soils. Information gathered on park vegetation cover types is described in

Chapter 3, including the type of vegetative cover found along the road corridors that would be disturbed under the proposed alternatives. Disturbances were estimated based on the length and expected width of the proposed pathways or shoulders in each area transected. Impacts from improved road shoulders were estimated by applying an expected 5-ft (1.5-m) width of permanent vegetation disturbance and a 5-ft (1.5-m) width of temporary construction-related disturbance (i.e., extension of existing shoulder on both sides). Impacts from construction of separated multi-use pathways were estimated by applying

a 14-ft (4.2-m) width of permanent vegetation disturbance plus a 14-ft (4.2-m) width of temporary, construction-related disturbance (i.e., heavy machinery use, grading, or stockpiling). For estimating the number of trees removed, a 16-ft (4.8-m) pathway was used (14 ft plus 1-ft tree clear zone on either side). In all cases, precise pathway locations and exact specifications have not been determined. As a result, some amount of error in disturbance estimates is expected.

| Impact Threshold Definitions | |
|-------------------------------------|---|
| Negligible | No native vegetation would be affected, or some individual native plants could be affected as a result of the alternative, but there would be no effect on native species populations. The effects would be on a small scale. |
| Minor | The alternative would temporarily affect some individual native plants and would also affect a relatively minor portion of that species' population. Mitigation to offset adverse effects could be required and would be effective. |
| Moderate | The alternative would affect some individual native plants and would also affect a sizeable segment of the species' population over a relatively large area. Mitigation to offset adverse effects could be extensive but would likely be successful. |
| Major | The alternative would have a considerable effect on native plant populations and would affect a relatively large area in and outside of the Park. Mitigation measures to offset the adverse effects would be required and would be extensive; success of the mitigation measures would not be guaranteed. |
| Duration | Short term – recovers in less than 3 years. |
| | Long term – requires more than 3 years to recover. |
| Area of Analysis | Within park boundary. |

| Plant Species of Special Concern | |
|---|--|
| Negligible | A small number of individual plants and/or a small amount of their respective habitat would be adversely affected via direct or indirect impacts associated with a given alternative. Populations would not be affected or the effects would be below a measurable level of detection. Mitigation measures would not be warranted. |
| Minor | Effects to individual plants and/or their respective habitats would be more numerous and detectable. Populations would not be affected or the effects would be below a measurable level of detection. Mitigation measures would be needed and would be successful in reducing adverse effects. |
| Moderate | Effects to individual plants 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. |
| Major | Effects to individual plants and their habitat would be obvious and would have substantive consequences on a regional population level. Extensive mitigation measures would be needed to reduce any adverse effects; their success would not be guaranteed. |
| Duration | Short term: Impact lasts 1 to 5 years and can be easily reversed. |
| | Long term: Impact lasts 6 or more years and cannot be easily reversed. |
| Area of Analysis | Within park boundary. |



Effects of Alternative 1 — No Action

Under the No Action Alternative (Alternative 1), there would be no direct impacts to vegetation from construction of new transportation or information kiosks/signs. Impacts to vegetation would be limited and occur only where continued road maintenance activities would temporarily disturb vegetation near work locations and in areas where visitors pull off the road or use social trails. Maintenance activities would require revegetation and other mitigation to control dust, noxious weeds, and erosion of the soil base. Impacts to vegetation near roadways, parking lots, and along social trails would continue from localized trampling, which would result in breakage, loss of productivity, and eventual loss of vegetation in certain areas. These actions, plus the limited disturbance from road maintenance, would result in long-term, localized, negligible to minor, adverse impacts to vegetation, mainly confined to areas that have already been disturbed.

Plant Species of Special Concern

No individuals or populations of federally listed plants are present in Grand Teton National Park. Three plant species of special concern would be present within the project area. The largeflower triteleia (*Triteleia grandiflora*) grows within 5 ft (1.5 m) of the Moose-Wilson Road, and the flat-top broomrape (*Orobancha corymbosa*) grows along a dirt road south of Moose. Under Alternative 1, several management strategies would be tested along the Moose-Wilson Road, such as restrictions on motorized vehicles, potential closures, etc. Before any actions are taken that could adversely affect the area bordering the road, a rare plant survey would be conducted prior to implementation of the decision. Therefore, no (or negligible) direct or indirect effects to these plant species of special concern are expected to result from implementation of Alternative 1. Current use of the road and associated increased generation of dust would not adversely impact sensitive plants growing along or in the vicinity of the Moose-Wilson Road.

The third species of special concern, Teton wirelettuce (*Stephanomeria fluminea*), may occur along the streambanks of the Snake River or its tributaries on the eastern side of the project area. Alternative 1 would not affect this species since no actions are proposed for these areas.

Cumulative Impacts

Several recent, current, and planned projects within the Park would adversely affect vegetation. These projects include construction of a new visitor center at Moose,

replacement of the Moose Entrance Station, construction related to the LSR Preserve, upgrades to the Jenny Lake Lodge visitor accommodations and employee housing facilities, reconstruction and widening of North Park Road between Lizard Creek Campground and the South Entrance of Yellowstone, replacement of the Snake River Bridge near Flagg Ranch, and the chip-and-seal project from Moran to Jackson Lake Lodge. All of these developments would occur in areas where human activities are already concentrated, thus minimizing impacts in previously undisturbed areas. Furthermore, mitigation measures would be implemented that preserve topsoil, reclaim with native vegetation, and control erosion, noxious weeds, and possible spills of oils or other fuels used in construction equipment. Widening of North Park Road would result in the permanent loss of approximately 33.0 acres (13.0 ha) of vegetation along an existing road corridor within the Park. All of these projects would also result in the permanent loss of vegetation along existing road corridors or on developed sites and short-term construction-related disturbance where vegetation is disturbed; however, reclamation/replanting would occur in those areas.

The ecosystem is experiencing a long-term drought (with drier winters and wetter summers), which contributes to the establishment and survival of non-native plant species, especially in areas of high foot, horse, and vehicular traffic, as well as on lands disturbed for construction or other reasons. This park, YNP, and other jurisdictions have documented a continued increase in the number and distribution of exotic or invasive plant species during the past two decades. Part of this increase is a likely result of increased data collection and problem identification; however, there is a long-term need for exotic plant monitoring and control efforts on behalf of the Park and neighboring landowners and managers.

No cumulative effects to federally listed plant species are expected from implementation of Alternative 1 because none are present. No cumulative effects to plant species of special concern are expected from implementing Alternative 1 because the two species potentially present near the Moose-Wilson Road would not be adversely affected, and no actions are proposed in the area preferred by the third species.

The impacts of past, present, and future actions, in conjunction with vegetation impacts resulting from Alternative 1, would result in long-term, minor, adverse cumulative impacts to vegetation in the Park. Alternative 1 would contribute a negligible increment to overall cumulative impacts.

Conclusion

Alternative 1 would result in long-term, localized, negligible to minor, adverse impacts from the degradation of native vegetation in and near areas with concentrated human use and areas of social trails and off-road parking and trampling. No (or negligible) direct or indirect effects to plant species of special concern are expected to result from implementation of Alternative 1. Cumulative impacts to vegetation would be long term, minor, and adverse.

Because there would be no major, adverse impacts to plant species, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's vegetation resources and no unacceptable impacts.

Effects of Alternative 2 — Improved Road Shoulders

Under Alternative 2, impacts to vegetation would occur from the same actions as described for Alternative 1, including continued off-road parking and use of social trails and occasional road maintenance, with resultant negligible to minor direct adverse impacts. Alternative 2 would also include direct, adverse impacts related to the widening of the Teton Park Road. This widening would permanently remove approximately 13.3 acres (5.4 ha) of vegetation immediately adjacent to existing road shoulders, which consists mostly of a low cover of grasses and forbs, including both native and exotic species (see Table 19). Adjacent vegetation would consist of mostly dry sagebrush shrubland with small areas of riparian shrubs and cottonwoods along creek or river crossings. Some coniferous trees and associated understory species would be affected between Jenny Lake and Signal Mountain. Areas next to the existing shoulder that would be temporarily disturbed (an estimated additional 13.3 acres [5.4 ha]) by the construction crews would be revegetated using native grasses and weed-free seed; therefore, impacts from these actions would be long term, localized, negligible to minor, and adverse.

Visitor information kiosks would be installed within activity areas on existing disturbed ground and would not result in new net disturbance. Under Alternative 2, roadside variable messaging signs would be installed at locations within and outside the Park. These signs would also be located on existing disturbed grounds at roadway shoulders and major intersections, and thus would constitute no additional permanent disturbance.

All construction would be monitored for noxious weed invasion. The spread of noxious weeds results in long-term impacts, which would be kept at the minor level due to monitoring and treatment. Noxious weeds could spread into areas that are disturbed during construction of multi-use pathways and widening of road shoulders. This impact is expected to be minor, adverse, and localized, but long-term, with prompt revegetation of disturbed areas and implementation of measures to control noxious weeds (i.e., annual monitoring and appropriate manual, chemical, or biological control). However, long-term monitoring of all travel corridors and disturbed zones would be required as part of the Park's ongoing efforts to control the spread of non-native plant species.

Plant Species of Special Concern

No direct or indirect effects to federally listed plants are expected to result from implementation of Alternative 2 due to their absence in Grand Teton National Park. The plant species of special concern reported to be present in the Moose-Wilson Road vicinity would be impacted by options tested in this area, similar to Alternative 1. A rare plant survey would be conducted prior to implementation of Alternative 2 and appropriate mitigation measures taken if these or other rare plants are found within the disturbance area. The plant species found along the Snake River and its drainages would not be affected by actions in Alternative 2. Therefore, adverse impacts to these species would be negligible.

Cumulative Impacts

Recent, current, and planned projects within Grand Teton National Park that would adversely impact vegetation would be the same as for Alternative 1. The ecosystem is experiencing a long-term drought (with drier winters and wetter summers), which contributes to the establishment and survival of non-native plant species, especially in areas of high foot, horse, and vehicular traffic, as well as on lands disturbed for construction or other reasons. This park, YNP, and other jurisdictions have documented a continued increase in the number and distribution of exotic or invasive plant species during the past two decades. Part of this increase is a likely result of increased data collection and problem identification; however, there is a long-term need for exotic plant monitoring and control efforts on behalf of the Park and neighboring landowners and managers.



No cumulative effects to federally listed plant species are expected from implementation of Alternative 2 because none are present; no cumulative effects to plant species of special concern are expected from implementing Alternative 2 because the two species (largeflower triteleia and flat-top broomrape) potentially present near the Moose-Wilson Road would not be adversely affected; and no actions are proposed in the area preferred by the third species (Teton wirelettuce).

Overall, impacts of past, present, and future actions, in conjunction with impacts of Alternative 2, would result in long-term, minor, adverse impacts to vegetation within the Park. Alternative 2 would contribute a minor amount to overall cumulative impacts.

Conclusion

Alternative 2 would result in long-term, localized, negligible to minor, adverse impacts to vegetation due to continued use of social trails, illegal off-road parking, and construction of shoulders along a portion of the Teton Park Road, with short- and long-term, localized, minor, adverse impacts associated with construction. Adverse impacts to plant species of special concern would be negligible. Cumulative impacts to vegetation would be long-term, minor, and adverse.

Because there would be no major, adverse impacts to plant species, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's vegetation resources and no unacceptable impacts.

Effects of Alternative 3 — Improved Road Shoulders / Multi-Use Pathways

Alternative 3 would result in the permanent removal of approximately 63.8 acres (25.8 ha) of vegetation, including 5,200 to 7,100 trees, of which 625 to 1,175 would be over 12 inches in diameter (Table 17). Additionally, 1.4 acres (0.57 ha) of wetlands would be impacted under this alternative (Table 18). Alternative 3 would result in removal of 5.5 acres (2.2 ha) of forests, 40.4 acres (16.3 ha) of shrublands, and 17.6 acres (7.1 ha) of grasslands or barren areas (see Table 19).

In areas where many trees are removed, additional trees could succumb to root damage caused by soil movement during construction or because opening up the tree canopy

would make remaining trees more susceptible to wind throw. Construction areas would be monitored during and after construction activity for hazard trees; in subsequent years, a minor increase could occur in the number of trees needing to be removed for human safety adjacent to roads and pathways. Overall, the construction of the pathways described above and resultant removal of vegetation and trees would result in long-term, localized, moderate, adverse impacts to vegetation.

Construction of new shoulders along the Teton Park Road and North Park Road from North Jenny Lake to Colter Bay would permanently remove approximately 14.9 acres (6.0 ha) of vegetation and cause temporary disturbance of at least another 14.9 acres where construction equipment is used adjacent to the main work area. Roadside vegetation that would be affected by shoulder widening would be a low cover of mostly grasses and forbs, including both native and exotic species, as the shoulder widening would not intrude into adjacent vegetation types. Much of the area along the roads that would be affected consists of dry sagebrush shrubland; however, from Jenny Lake Junction north to Signal Mountain and Jackson Lake Dam, and also closer to Colter Bay, the roadway often passes through lodgepole pine forest. There are also wet meadows and some wetlands near the existing roads, especially in the Willow Flats area near Jackson Lake. Road widening in these areas would adversely affect some wetlands and associated plant species and require mitigation to ensure no net loss of park wetlands.

Construction of multi-use pathways along roadways throughout the Park would result in the permanent removal of approximately 44.9 acres (18.1 ha) of vegetation and cause temporary disturbance to at least 44.9 additional acres. Although specific alignments have not yet been determined, the pathways would generally be located within 50 ft (15 m) of roadways. Vegetation impacts in the southern half of the Park would include mostly sagebrush shrubland, with some cottonwood riparian cover along the Gros Ventre and Snake Rivers, and taller riparian shrubs and cottonwoods along Cottonwood Creek.

**TABLE 17
NUMBER OF TREES REMOVED BY ALTERNATIVE 3**

| Road Segment | Tree Density | Linear Feet Affected | < 6 inches | 6-12 inches | > 12 inches | Total |
|---|---------------------|-----------------------------|----------------------|--------------------|-----------------------|--------------------|
| Granite Canyon Entrance Station to the LSR Preserve | High | 2,750 | 1,700-1,900 | 50-100 | 25-75 | 1,775-2,075 |
| | Medium | 1,322 | 300-400 | 75-175 | 25-75 | 400-650 |
| | Low | 2,922 | 375-475 | 125-175 | 250-350 | 750-1,000 |
| | None | 4,916 | 0 | 0 | 0 | 0 |
| | Total | 11,910 | 2,375-2,775 | 250-450 | 300-500 | 2,925-3,725 |
| LSR Preserve to Moose | High | 0 | 0 | 0 | 0 | 0 |
| | Medium | 919 | 200-300 | 50-100 | 0-50 | 250-450 |
| | Low | 511 | 50-100 | 0-50 | 25-75 | 75-225 |
| | None | 8,296 | 0 | 0 | 0 | 0 |
| | Total | 9,725 | 250-400 | 50-150 | 25-125 | 325-675 |
| South Boundary to Antelope Flats | High | 0 | 0 | 0 | 0 | 0 |
| | Medium | 0 | 0 | 0 | 0 | 0 |
| | Low | 2,902 | 400-500 | 125-175 | 250-350 | 775-1,025 |
| | None | 45,645 | 0 | 0 | 0 | 0 |
| | Total | 48,547 | 400-500 | 125-175 | 250-350 | 775-1,025 |
| Moose to North Jenny Lake Junction | High | 1,202 | 750-850 | 0-50 | 0-50 | 750-950 |
| | Medium | 856 | 200-250 | 50-100 | 0-50 | 250-400 |
| | Low | 852 | 100-150 | 25-75 | 50-100 | 175-325 |
| | None | 53,944 | 0 | 0 | 0 | 0 |
| | Total | 56,854 | 1,050-1,250 | 75-225 | 50-200 | 1,175-1,675 |
| Grand Total | | 127,036 | 4,075-4,925 | 500-1,000 | 625-1,175 | 5,200-7,100 |



**TABLE 18
SUMMARY OF DIRECT LOSS OF POTENTIAL WETLANDS¹ (ACRES) FROM
LINEAR ROAD FEATURES AND SEPARATED PATHWAYS BY ALTERNATIVE**

| Road Segment | Road Features | | | | | Separated Pathways | | | | |
|---|---------------|-------------|-------------|-------------|-------------|--------------------|-------------|-------------|-------------|-------------|
| | Alternative | | | | | Alternative | | | | |
| | 1 | 2 | 3 | 3a | 4 | 1 | 2 | 3 | 3a | 4 |
| South Boundary to North Jenny Lake | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.14 | 1.24 | 1.14 |
| South Boundary to Antelope Flats | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.39 | 0.39 | 0.39 |
| Gros Ventre Junction to West Boundary | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 |
| Moose to Signal Mountain | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.75 | 0.75 | 0.75 |
| North Jenny Lake Junction to String Lake | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| North Jenny Lake to Colter Bay | 0.00 | 0.00 | 0.08 | 0.20 | 0.02 | 0.00 | 0.00 | 0.00 | 2.25 | 2.86 |
| Signal Mountain to Jackson Lake Junction | 0.00 | 0.00 | 0.06 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 1.96 | 1.96 |
| Jackson Lake Junction to Colter Bay | 0.00 | 0.00 | 0.02 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.29 | 0.90 |
| Granite Canyon Entrance Station to Moose | 0.00 | 0.00 | 0.04 | 0.16 | 0.04 | 0.00 | 0.00 | 0.14 | 0.00 | 0.20 |
| Granite Canyon Entrance Station to Moose | 0.00 | 0.00 | 0.04 | 0.16 | 0.04 | 0.00 | 0.00 | 0.14 | 0.00 | 0.20 |
| TOTAL² | 0.00 | 0.02 | 0.12 | 0.36 | 0.06 | 0.00 | 0.00 | 1.28 | 3.49 | 4.20 |

¹Figures represent net difference from existing condition.

²Total wetland acres lost for Alternative 1 0.00

Alternative 2 0.02

Alternative 3 1.40

Alternative 3a 3.85

Alternative 4 4.26

Note: Values for wetland impacts have been updated to correct miscalculations in the Draft Plan/EIS.

**TABLE 19
ESTIMATES OF DIRECT HABITAT LOSS¹ (ACRES) FROM LINEAR FEATURES
BY HABITAT TYPE AND ALTERNATIVE**

| Habitat Type | Road Features ² | | | | | Separated Pathways | | | | |
|--------------------------|----------------------------|--------------|--------------|--------------|-------------|--------------------|-------------|--------------|--------------|--------------|
| | Alternative | | | | | Alternative | | | | |
| | 1 | 2 | 3 | 3a | 4 | 1 | 2 | 3 | 3a | 4 |
| Barren | 0.00 | 12.29 | 13.69 | 12.93 | 1.91 | 0.00 | 0.00 | 1.64 | 2.79 | 3.02 |
| Coniferous Forest | 0.00 | 0.16 | 0.80 | 1.82 | 0.40 | 0.00 | 0.00 | 1.17 | 1.52 | 9.53 |
| Coniferous Woodland | 0.00 | 0.15 | 0.29 | 0.84 | 0.04 | 0.00 | 0.00 | 1.16 | 2.72 | 4.22 |
| Deciduous Forest | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.18 | 0.29 | 1.06 |
| Deciduous Woodland | 0.00 | 0.01 | 0.00 | 0.26 | 0.00 | 0.00 | 0.00 | 0.70 | 0.50 | 1.60 |
| Dwarf Shrubland | 0.00 | 0.02 | 0.12 | 0.06 | 0.00 | 0.00 | 0.00 | 5.05 | 7.55 | 6.87 |
| Herbaceous Vegetation | 0.00 | 0.06 | 0.16 | 1.18 | 0.08 | 0.00 | 0.00 | 2.11 | 2.87 | 3.60 |
| Mixed Forest | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.06 |
| Mixed Woodland | 0.00 | 0.00 | 0.00 | 0.49 | 0.00 | 0.00 | 0.00 | 1.15 | 0.41 | 1.92 |
| Shrubland | 0.00 | 0.58 | 3.86 | 5.83 | 3.59 | 0.00 | 0.00 | 31.41 | 40.60 | 46.88 |
| Sparse Vegetation | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Streams | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.22 | 0.17 | 0.32 |
| TOTAL³ | 0.00 | 13.28 | 18.93 | 23.46 | 6.03 | 0.00 | 0.00 | 44.85 | 59.42 | 79.08 |

¹Figures represent net difference from existing condition.

²Road features include a combination of asphalt, gravel, signs, etc. associated with a widened road shoulder.

³Total acres lost for
 Alternative 1 0.00
 Alternative 2 13.28
 Alternative 3 63.78
 Alternative 3a 82.88
 Alternative 4 85.11

Road realignment along portions of the Moose-Wilson Road would result in the permanent removal of approximately 3.9 acres (1.6 ha) of vegetation. An additional approximately 3.9 acres would be temporarily impacted due to construction activities. The vegetation in this area consists primarily of sagebrush shrubland and tall shrub communities interspersed with pockets of aspen forest, lodgepole pine and mixed conifer forest, and mixed aspen-conifer stands.

Relocation of a portion of the Moose-Wilson Road, between a point approximately one-third mile (0.5 km) north of Death Canyon Trailhead Road and Sawmill Ponds Overlook, would result in construction activity in wet meadows and willow habitats. The short-term disturbance associated with construction would result in a minor benefit to native plant communities. Although

the existing national wetland inventory data does not indicate wetlands in this area, finer-scale mapping of wetlands conducted during the planning and design phases of construction could result in identification of a small amount of wetlands that could be lost and require mitigation as a result of road relocation and construction. Attempts would be made to regenerate aspen in the area vacated by the existing road; this could restore approximately 3.1 acres (1.2 ha) of aspen habitat. However, as the Park has not made similar efforts yet, the successful regeneration and restoration of this plant community is not assured.

Disturbance from construction activities and off-trail visitor use would provide increased opportunities for the spread of exotic plant species, some of which (St. Johnswort, Dalmatian toadflax, yellow toadflax,



houndstongue, musk thistle, and Canada thistle) already have become established in the Moose-Wilson Road corridor and along the Teton Park Road, especially from Moose to Jenny Lake. All multi-use pathways would be monitored for noxious weed invasion and controlled annually, resulting in long-term, localized, minor to moderate, beneficial impacts. Noxious weeds could spread into areas that are disturbed during construction of multi-use pathways and improved road shoulders. This adverse impact is expected to be minor but short term in localized sites, with prompt revegetation of disturbed areas and implementation of measures to control noxious weeds (i.e., annual monitoring and appropriate manual, chemical, or biological control).

Plant Species of Special Concern

No direct or indirect effects to federally listed plants are expected to result from implementation of Alternative 3 due to their absence in Grand Teton National Park. No direct or indirect effects to plant species of special concern are expected to result from implementation of Alternative 3 since a rare plant survey within the project area would be conducted before implementing any management strategies along the Moose-Wilson Road or in the vicinity of streams with appropriate habitat in the Gros Ventre area.

Cumulative Impacts

Recent, current, and planned projects within Grand Teton National Park that would adversely impact vegetation under this alternative would be the same as for Alternative 1. The ecosystem is experiencing a long-term drought (with drier winters and wetter summers), which contributes to the establishment and survival of non-native plant species, especially in areas of high foot, horse, and vehicular traffic, as well as on lands disturbed for construction or other reasons. This park, YNP, and other jurisdictions have documented a continued increase in the number and distribution of exotic or invasive plant species during the past two decades. Part of this increase is a likely result of increased data collection and problem identification; however, there is a long-term need for exotic plant monitoring and control efforts on behalf of the Park and neighboring landowners and managers.

No cumulative effects to federally listed plant species are expected from implementation of Alternative 3 because none are present. No cumulative effects to plant species of special concern are expected from implementation of Alternative 3 because surveys would be conducted

as needed to ensure that species would not be adversely affected.

The impacts of past, present, and future actions, in conjunction with the beneficial and adverse impacts of Alternative 3, would result in long-term, minor, adverse cumulative impacts to vegetation within the Park. Alternative 3 would contribute a small amount to adverse cumulative impacts and would contribute negligibly to the long-term benefits to vegetation.

Conclusion

Alternative 3 would result in the permanent removal of approximately 63.8 acres (25.8 ha) of vegetation, including 5,200 to 7,100 trees, of which 625 to 1,175 would be over 12 inches in diameter (Table 17). Actions under Alternative 3 would result in long-term, localized, moderate, adverse impacts on vegetation and long-term, localized, negligible, beneficial impacts to vegetation, chiefly because of the construction and eventual use of the pathways system and the improvements and markings of social trails. Widening road shoulders would result in minor to moderate alteration of plant communities, especially in wetland areas and in heavily forested areas. New pathways would be located in relatively undisturbed areas off the main roadways that currently exist in Grand Teton National Park.

In the short term, localized, moderate, adverse impacts would occur where construction disturbs vegetation. With proper and successful regeneration, the long-term, adverse impacts in construction areas would be negligible to minor, although long-term monitoring and control of exotic plants, if found to persist, would need to continue.

No direct or indirect effects to plant species of special concern are expected to result from implementation of Alternative 3.

Cumulative impacts to vegetation within the Park from Alternative 3 would be long-term, minor, and adverse.

Because there would be no major, adverse impacts to plant species, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's vegetation resources and no unacceptable impacts.

Effects of Alternative 3a — Preferred Alternative

Alternative 3a would result in the permanent removal of approximately 82.9 acres (33.5 ha) of vegetation, including 17,900 to 23,075 trees, of which 1,125 to 2,375 would be over 12 inches in diameter (Table 20). The majority of tree removal (approximately 70 percent) would occur between North Jenny Lake Junction and Colter Bay, as coniferous forest becomes more predominant in the northern parts of the project area. Additionally, 3.85 acres (1.56 ha) of wetlands would be impacted under this alternative (see Table 18). Alternative 3a would result in removal of 8.9 acres (3.6 ha) of forests, 54.0 acres (21.9 ha) of shrublands, and 19.8 acres (8.0 ha) of grasslands or barren areas (see Table 19).

Construction of multi-use pathways along U.S. Highway 26/89/191, the Teton Park Road, and North Park Road would result in the permanent removal of approximately 59.4 acres (24.0 ha) of vegetation and cause temporary disturbance to approximately 59.4 additional acres. Although specific alignments have not yet been determined, the pathways would generally be located within 50 ft (15 m) of existing roadbeds. Vegetation removed would include mostly sagebrush shrubland in the southern half of the project area as well as conifer forests, some cottonwood riparian cover (mostly along the Gros Ventre and Snake Rivers and along Cottonwood Creek), and several acres each of aspen, willow, and meadows.

The creation of multi-use pathways along the Moose-Wilson Road would permanently remove approximately 12.1 acres (4.9 ha) of vegetation and temporarily impact a minimum of 12.1 additional acres due to construction activities. This vegetation consists of aspen forest, lodgepole pine and mixed conifer forest, wetland meadows near Sawmill Ponds, and mixed aspen-conifer stands, as well as some sagebrush shrubland and tall shrub communities. While every effort would be made to design and construct the Moose-Wilson pathway so as to minimize the number of trees removed, the removal of a large number of trees would result in an obvious change in the character of the corridor, which would be clearly evident to most visitors. This change would be more extensive and evident than in Alternative 3 because more of the corridor would be affected by the construction of the pathway. This area contains the only lands along the foot of the Teton Range that have not experienced fire activity in the past 35 years; where forested, the canopy cover is thus green and fairly closed and shady compared to areas north, such as in the Taggart and Jenny Lake areas.

Because of the closed canopy, the topography, and the road's proximity to the mountains, views of the high peaks are limited along this corridor. In contrast, the vegetation is more of an apparent foreground feature than in areas where the Teton Mountains pose a spectacular backdrop. These mixed aspen-conifer forests, with their well-developed understory, also have a high diversity compared to other forested plant communities (McCloskey 2006). Opening the overstory would result in changes to understory vegetation composition.

In areas where many trees are removed, additional trees could succumb to root damage caused by soil movement during construction or because opening up the tree canopy would make remaining trees more susceptible to wind throw. Construction areas would be monitored during and after construction activity for hazard trees. In subsequent years, a minor increase could occur in the number of trees needing to be removed for human safety adjacent to roads and pathways. Overall, the construction of the pathways described above and resultant removal of vegetation and trees would result in long-term, localized, moderate adverse impacts to vegetation.

Relocation of a portion of the Moose-Wilson Road, between a point approximately one-third mile (0.5 km) north of Death Canyon Trailhead Road and Sawmill Ponds Overlook, would result in construction activity in wet meadows and willow habitats and would cause the permanent removal of approximately 3.9 acres (1.6 ha) of vegetation and cause temporary disturbance to approximately 3.9 additional acres. The short-term disturbance associated with construction would result in a minor benefit to native plant communities. Although the existing national wetland inventory data do not indicate wetlands in this area, finer-scale mapping of wetlands conducted during the planning and design phases of construction could result in identification of a small amount of wetlands that could be lost and require mitigation as a result of road relocation and construction. Attempts would be made to regenerate aspen in the area vacated by the existing road. This could restore approximately 3.1 acres (1.2 ha) of aspen habitat. However, as the Park has not made similar efforts yet, the successful regeneration and restoration of this plant community are not assured.



**TABLE 20
NUMBER OF TREES REMOVED BY ALTERNATIVE 3A**

| Road Segment | Tree Density | Linear Feet Affected | < 6 inches | 6-12 inches | > 12 inches | Total |
|---|---------------------|-----------------------------|----------------------|--------------------|-----------------------|--------------------|
| Granite Canyon Entrance Station to the LSR Preserve | High | 2,750 | 1,300-1,500 | 25-75 | 25-75 | 1,350-1,650 |
| | Medium | 1,322 | 225-325 | 50-100 | 25-75 | 300-500 |
| | Low | 2,922 | 275-375 | 75-125 | 150-250 | 500-750 |
| | None | 4,916 | 0 | 0 | 0 | 0 |
| | Total | 11,910 | 1,800-2,200 | 150-300 | 200-400 | 2,150-2,900 |
| the LSR Preserve to Moose | High | 0 | 0 | 0 | 0 | 0 |
| | Medium | 919 | 200-300 | 50-100 | 0-50 | 250-450 |
| | Low | 511 | 50-100 | 0-50 | 25-75 | 75-225 |
| | None | 8,296 | 0 | 0 | 0 | 0 |
| | Total | 9,725 | 250-400 | 50-150 | 25-125 | 325-675 |
| South Boundary to Antelope Flats | High | 0 | 0 | 0 | 0 | 0 |
| | Medium | 0 | 0 | 0 | 0 | 0 |
| | Low | 2,902 | 400-500 | 125-175 | 250-350 | 775-1,025 |
| | None | 45,645 | 0 | 0 | 0 | 0 |
| | Total | 48,547 | 400-500 | 125-175 | 250-350 | 775-1,025 |
| Gros Ventre Junction to West Boundary | High | 0 | 0 | 0 | 0 | 0 |
| | Medium | 0 | 0 | 0 | 0 | 0 |
| | Low | 0 | 0 | 0 | 0 | 0 |
| | None | 5,108 | 0 | 0 | 0 | 0 |
| | Total | 5,108 | 0 | 0 | 0 | 0 |
| Moose to North Jenny Lake Junction | High | 1,202 | 750-850 | 0-50 | 0-50 | 750-950 |
| | Medium | 856 | 175-275 | 50-100 | 0-50 | 225-425 |
| | Low | 852 | 75-175 | 25-75 | 50-100 | 150-350 |
| | None | 53,944 | 0 | 0 | 0 | 0 |
| | Total | 56,854 | 1,000-1,300 | 75-225 | 50-200 | 1,125-1,725 |
| North Jenny Lake Junction to String Lake | High | 0 | 0 | 0 | 0 | 0 |
| | Medium | 1,768 | 425-525 | 125-175 | 50-100 | 600-800 |
| | Low | 630 | 75-125 | 0-50 | 25-75 | 100-250 |
| | None | 5,529 | 0 | 0 | 0 | 0 |
| | Total | 7,926 | 500-650 | 125-225 | 75-175 | 700-1,050 |
| North Jenny Lake Junction to Signal Mountain | High | 9,178 | 2,500-3,500 | 100-150 | 75-125 | 2,675-3,775 |
| | Medium | 3,497 | 425-525 | 125-175 | 50-100 | 600-800 |
| | Low | 3,464 | 200-300 | 50-100 | 150-200 | 400-600 |
| | None | 21,053 | 0 | 0 | 0 | 0 |
| | Total | 37,193 | 3,125-4,325 | 275-425 | 275-425 | 3,675-5,175 |

**TABLE 20
NUMBER OF TREES REMOVED BY ALTERNATIVE 3A**

| Road Segment | Tree Density | Linear Feet Affected | < 6 inches | 6-12 inches | > 12 inches | Total |
|---|--------------|----------------------|----------------------|--------------------|--------------------|----------------------|
| Signal Mountain to Jackson Lake Dam | High | 8,335 | 2,700-2,800 | 100-150 | 75-125 | 2,875-3,075 |
| | Medium | 0 | 0 | 0 | 0 | 0 |
| | Low | 374 | 0-50 | 0-25 | 0-50 | 0-125 |
| | None | 1,256 | 0 | 0 | 0 | 0 |
| | Total | 9,965 | 2,700-2,850 | 100-175 | 75-175 | 2,875-3,200 |
| Jackson Lake Dam to Jackson Lake Junction | High | 2,098 | 650-750 | 0-50 | 0-50 | 650-850 |
| | Medium | 0 | 0 | 0 | 0 | 0 |
| | Low | 2,990 | 200-250 | 50-100 | 125-175 | 375-525 |
| | None | 972 | 0 | 0 | 0 | 0 |
| | Total | 6,060 | 850-1,000 | 50-150 | 125-225 | 1,025-1,375 |
| Jackson Lake Junction to Colter Bay | High | 14,552 | 4,700-4,900 | 175-275 | 125-175 | 5,000-5,350 |
| | Medium | 1,329 | 150-250 | 25-75 | 0-50 | 175-375 |
| | Low | 949 | 50-100 | 0-50 | 25-75 | 75-225 |
| | None | 12,065 | 0 | 0 | 0 | 0 |
| | Total | 28,894 | 4,900-5,250 | 200-400 | 150-300 | 5,250-5,950 |
| Grand Total | | 222,182 | 15,525-18,475 | 1,150-2,225 | 1,225-2,375 | 17,900-23,075 |

Disturbance from construction activities and off-trail visitor use would provide increased opportunities for the spread of exotic plant species, some of which (St. Johnswort, Dalmatian toadflax, yellow toadflax, houndstongue, musk thistle, and Canada thistle) already have become established in the Moose-Wilson Road corridor and along the Teton Park Road, especially from Moose to Jenny Lake. All multi-use pathways would be monitored for noxious weed invasion and controlled annually, resulting in localized, minor to moderate, long-term adverse impacts. Noxious weeds could spread into areas that are disturbed during construction of multi-use pathways and improved road shoulders. This adverse impact is expected to be minor but short term in localized sites, with prompt revegetation of disturbed areas and implementation of measures to control noxious weeds (i.e., annual monitoring and appropriate manual, chemical, or biological control).

Plant Species of Special Concern

No direct or indirect effects to federally listed plants are expected to result from implementation of Alternative 3a due to their absence in Grand Teton National Park. No direct or indirect effects to plant species of special concern are expected to result from implementation of Alternative 3a since a rare plant survey within the project area would be conducted before implementing any management strategies along the Moose-Wilson Road or in the vicinity of streams with appropriate habitat in the Gros Ventre area.

Cumulative Impacts

Recent, current, and planned projects within Grand Teton National Park that would adversely impact vegetation under this alternative would be the same as for Alternative 1. The ecosystem is experiencing a long-term drought (with drier winters and wetter summers), which contributes to the establishment and survival of non-native plant species, especially in areas of high foot,



horse, and vehicular traffic, as well as on lands disturbed for construction or other reasons. This park, YNP, and other jurisdictions have documented a continued increase in the number and distribution of exotic or invasive plant species during the past two decades. Part of this increase is a likely result of increased data collection and problem identification; however, actions in this alternative contribute, in at least a minor way, to the long-term need for exotic plant monitoring and control efforts on behalf of the Park and neighboring landowners and managers.

No cumulative effects to federally listed plant species are expected from implementation of Alternative 3a because none are present. No cumulative effects to plant species of special concern are expected from implementation of Alternative 3a because surveys would be conducted as needed to ensure that species would not be adversely affected.

The impacts of past, present, and future actions, in conjunction with the beneficial and adverse impacts of Alternative 3a, would result in long-term, minor to moderate, adverse cumulative impacts to vegetation within the Park. Alternative 3a would contribute a moderate amount to adverse cumulative impacts and would contribute negligibly to the long-term benefits to vegetation.

Conclusion

The construction of the pathways and other actions proposed in Alternative 3a would result in long-term, localized, moderate, adverse impacts on vegetation and long-term, localized, negligible, beneficial impacts to vegetation, chiefly as a result of the construction and eventual use of the pathways system and the improvements and markings of social trails. Under Alternative 3a, construction of the pathways would occur along approximately 41.3 miles (67 km) of existing park roadways. This activity would permanently remove approximately 82.9 acres (33.5 ha) of vegetation and cause temporary disturbance to approximately the same number of additional acres. Vegetation removed would include an estimated 3.9 acres (1.6 ha) of wetlands that would be impacted under this alternative (see Table 18). Alternative 3a would result in removal of 8.9 acres (3.6 ha) of forests, 54.0 acres (21.9 ha) of shrublands, and 19.8 acres (8.0 ha) of grasslands or barren areas. The total number of trees likely to be removed under this alternative would be 17,900 to 23,075, of which 1,125 to 2,375 would be over 12 inches in diameter. Efforts would be made to

restore aspen to the former location of the Moose-Wilson Road, which is to be relocated east of Sawmill Ponds; however, the success of these efforts is not assured.

Additional short-term, localized, moderate, adverse impacts would occur where construction disturbs vegetation. With proper and successful regeneration, the long-term, adverse impacts in construction areas would be negligible, although long-term monitoring and control of exotic plants, if found to persist, would need to continue. The number of social trails could be reduced, or their locations altered, which would result in long-term, localized, negligible, beneficial impacts to vegetation that is currently receiving heavy foot traffic. Cumulative impacts would be long term, minor to moderate, and adverse.

No direct or indirect effects to plant species of special concern are expected to result from implementation of Alternative 3a.

Because there would be no major, adverse impacts to plant species, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's vegetation resources and no unacceptable impacts.

Effects of Alternative 4 — Multi-Use Pathways

Alternative 4 would result in the permanent removal of approximately 85.1 acres (34.5 ha) of vegetation, including 29,950 to 33,775 trees, of which 2,075 to 3,150 would be over 12 inches in diameter (Table 21). The majority of tree removal (approximately 71 percent) would occur between North Jenny Lake Junction and Colter Bay, and between the Granite Canyon Entrance Station and Moose (approximately 21 percent), as coniferous forest becomes more predominant in the northern parts of the project area and along the Moose-Wilson Road. Additionally, 4.3 acres (1.7 ha) of wetlands would be impacted under this alternative (see Table 18). Alternative 4 would result in removal of 18.8 acres (7.6 ha) of forests, 57.3 acres (23.2 ha) of shrublands, and 8.6 acres (3.5 ha) of grasslands or barren areas (see Table 19).

**TABLE 21
NUMBER OF TREES REMOVED BY ALTERNATIVE 4**

| Road Segment | Tree Density | Linear Feet Affected | < 6 inches | 6-12 inches | > 12 inches | Total |
|---|--------------|----------------------|-------------|-------------|-------------|-------------|
| Granite Canyon Entrance Station to the LSR Preserve | High | 2,750 | 1,750-1,850 | 50-100 | 25-75 | 1,825-2,025 |
| | Medium | 1,322 | 300-400 | 100-150 | 25-75 | 425-625 |
| | Low | 2,922 | 375-475 | 125-175 | 250-350 | 750-1,000 |
| | None | 4,916 | 0 | 0 | 0 | 0 |
| | Total | 11,910 | 2,425-2,725 | 275-425 | 300-500 | 3,000-3,650 |
| The LSR Preserve to Moose | High | 3,372 | 2,150-2,250 | 75-125 | 50-100 | 2,275-2,475 |
| | Medium | 1,801 | 450-550 | 150-200 | 50-100 | 650-850 |
| | Low | 1,732 | 225-275 | 75-125 | 150-200 | 450-600 |
| | None | 11,722 | 0 | 0 | 0 | 0 |
| | Total | 18,628 | 2,825-3,075 | 300-450 | 250-400 | 3,375-3,925 |
| South Boundary to Antelope Flats | High | 0 | 0 | 0 | 0 | 0 |
| | Medium | 0 | 0 | 0 | 0 | 0 |
| | Low | 2,902 | 400-500 | 125-175 | 250-350 | 775-1,025 |
| | None | 45,645 | 0 | 0 | 0 | 0 |
| | Total | 48,547 | 400-500 | 125-175 | 250-350 | 775-1,025 |
| Moose to North Jenny Lake Junction | High | 1,202 | 750-850 | 0-50 | 0-50 | 750-950 |
| | Medium | 856 | 200-250 | 50-100 | 0-50 | 250-400 |
| | Low | 852 | 100-150 | 25-75 | 50-100 | 175-325 |
| | None | 53,944 | 0 | 0 | 0 | 0 |
| | Total | 56,854 | 1,050-1,250 | 75-225 | 50-200 | 1,175-1,625 |
| North Jenny Lake Junction to Signal Mountain | High | 9,178 | 5,950-6,150 | 250-300 | 175-225 | 6,375-6,675 |
| | Medium | 3,497 | 900-1,000 | 300-350 | 125-150 | 1,325-1,500 |
| | Low | 3,464 | 500-550 | 125-225 | 300-400 | 925-1,175 |
| | None | 21,053 | 0 | 0 | 0 | 0 |
| | Total | 37,193 | 7,350-7,700 | 675-875 | 600-775 | 8,625-9,350 |
| Signal Mountain to Jackson Lake Dam | High | 8,333 | 0 | 0 | 0 | 0 |
| | Medium | 0 | 0 | 0 | 0 | 0 |
| | Low | 374 | 0 | 0 | 0 | 0 |
| | None | 1,255 | 0 | 0 | 0 | 0 |
| | Total | 9,962 | 0 | 0 | 0 | 0 |



**TABLE 21
NUMBER OF TREES REMOVED BY ALTERNATIVE 4**

| Road Segment | Tree Density | Linear Feet Affected | < 6 inches | 6-12 inches | > 12 inches | Total |
|---|---------------------|-----------------------------|----------------------|--------------------|-----------------------|----------------------|
| Jackson Lake Dam to Jackson Lake Junction | High | 2,098 | 1,350-1,450 | 50-100 | 25-75 | 1,425-1,625 |
| | Medium | 0 | 0 | 0 | 0 | 0 |
| | Low | 2,990 | 400-500 | 125-175 | 250-350 | 775-1,025 |
| | None | 972 | 0 | 0 | 0 | 0 |
| | Total | 6,060 | 1,750-1,950 | 175-275 | 275-425 | 2,200-2,650 |
| Jackson Lake Junction to Colter Bay | High | 14,552 | 9,500-9,700 | 400-500 | 250-350 | 10,150-10,550 |
| | Medium | 1,329 | 300-400 | 100-150 | 25-75 | 425-625 |
| | Low | 949 | 125-175 | 25-75 | 75-125 | 225-375 |
| | None | 12,065 | 0 | 0 | 0 | 0 |
| | Total | 28,894 | 9,925-10,275 | 525-725 | 350-500 | 10,800-11,550 |
| Grand Total | | 218,047 | 25,725-27,475 | 2,150-3,150 | 2,075-3,150 | 29,950-33,775 |

Construction of multi-use pathways along U.S. Highway 26/89/191, the Teton Park Road, and North Park Road would result in the permanent removal of approximately 79.1 acres (32.0 ha) of vegetation and cause temporary disturbance to approximately 79.1 additional acres. Although specific alignments have not yet been determined, the pathways would generally be located outside of existing roadbeds, except for a section between Signal Mountain Lodge and Jackson Lake Dam where an improved road would be constructed. Vegetation removed would include mostly sagebrush shrubland as well as some coniferous forests and woodlands and herbaceous plant cover (Table 19).

The creation of multi-use pathways along the Moose-Wilson Road would permanently remove approximately 13.9 acres (5.6 ha) of vegetation and temporarily impact a minimum of 13.9 additional acres (5.6 ha) due to construction activities. This vegetation consists of aspen forest, lodgepole pine and mixed conifer forest, wetland meadows near Sawmill Ponds, and mixed aspen-conifer stands, as well as sagebrush shrubland and tall shrub communities. While every effort would be made to design and construct the Moose-Wilson pathway so as to minimize the number of trees removed, a large number of trees (6,375 to 7,575) are expected to be removed.

In areas where many trees are removed, additional trees could succumb to root damage caused by soil movement during construction or because opening up the tree canopy would make remaining trees more susceptible to wind throw. Construction areas would be monitored during and after construction activity for hazard trees. In subsequent years, a minor increase could occur in the number of trees needing to be removed for human safety adjacent to roads and pathways. Overall, the construction of the pathways described above and resultant removal of vegetation and trees would result in localized, long-term, moderate, adverse impacts to vegetation.

As with Alternatives 3 and 3a, relocation of a portion of the Moose-Wilson Road, between a point approximately one-third mile (0.5 km) north of Death Canyon Trailhead Road and Sawmill Ponds Overlook, would result in construction activity in wet meadows and willow habitats and would cause the permanent removal of approximately 3.9 acres (1.6 ha) of vegetation and cause temporary disturbance to approximately 3.9 additional acres. The short-term disturbance associated with construction would result in a minor benefit to native plant communities. Although the existing national wetland inventory data do not indicate wetlands in this area, finer-scale mapping of wetlands conducted during the planning and design phases of construction could result in identification of a small amount of wetlands that could be lost and require mitigation as a result of road relocation and construction. Attempts would be made to regenerate aspen in the area vacated by the existing road. This could restore approximately 3.1 acres (1.2 ha) of aspen habitat. However, as the Park has not made similar efforts yet, the successful regeneration and restoration of this plant community is not assured.

Disturbance from construction activities and off-trail visitor use would provide increased opportunities for the spread of exotic plant species, some of which (St. Johnswort, Dalmatian toadflax, yellow toadflax, houndstongue, and musk and Canada thistles) already have become established in the Moose-Wilson Road corridor and along the Teton Park Road, especially from Moose to Jenny Lake. All multi-use pathways would be monitored for noxious weed invasion and controlled annually, resulting in minor to moderate long-term impacts. Noxious weeds could spread into areas that are disturbed during construction of multi-use pathways and improved road shoulders. This impact is expected to be minor but short term in localized sites, with prompt revegetation of disturbed areas and implementation of measures to control noxious weeds (i.e., annual monitoring and appropriate manual, chemical, or biological control).

Plant Species of Special Concern

No direct or indirect effects to federally listed plants are expected to result from implementation of Alternative 4 due to their absence in Grand Teton National Park. No direct or indirect effects to plant species of special concern are expected to result from implementation of Alternative 4 since a rare plant survey within the project area would be conducted before implementing any

management strategies along the Moose-Wilson Road or in the vicinity of streams with appropriate habitat in the Gros Ventre area.

Cumulative Impacts

Recent, current, and planned projects within Grand Teton National Park that would adversely impact vegetation under this alternative would be the same as for Alternative 1. The ecosystem is experiencing a long-term drought (with drier winters and wetter summers), which contributes to the establishment and survival of non-native plant species, especially in areas of high foot, horse, and vehicular traffic, as well as on lands disturbed for construction or other reasons. This park, YNP, and other jurisdictions have documented a continued increase in the number and distribution of exotic or invasive plant species during the past two decades. Part of this increase is a likely result of increased data collection and problem identification; however, actions in this alternative contribute, in at least a minor way, to the long-term need for exotic plant monitoring and control efforts on behalf of the Park and neighboring landowners and managers.

No cumulative effects to federally listed plant species are expected from implementation of Alternative 4 because none are present. No cumulative effects to plant species of special concern are expected from implementation of Alternative 4 because surveys would be conducted as needed to ensure that species would not be adversely affected.

The impacts of past, present, and future actions, in conjunction with the beneficial and adverse impacts of Alternative 4, would result in long-term, localized, minor to moderate, adverse cumulative impacts to vegetation within the Park. Alternative 4 would contribute a moderate amount to adverse cumulative impacts and would contribute negligibly to the long-term benefits to vegetation.

Conclusion

The construction of the pathways and other actions proposed in Alternative 4 would result in long-term, localized, moderate, adverse impacts on vegetation and long-term, localized, negligible, beneficial impacts to vegetation, chiefly as a result of the construction and eventual use of the pathways system and the improvements and markings of social trails.



Under Alternative 4, construction of the pathways and road features would occur along approximately 42.6 miles (69.4 km) of existing park roadways. This activity would permanently remove approximately 85.1 acres (34.5 ha) of vegetation, and cause temporary disturbance to approximately the same number of additional acres. Vegetation removed would include an estimated 18.8 acres (7.6 ha) of forests, 57.3 acres (23.2 ha) of shrublands, and 8.6 acres (3.5 ha) of grasslands or barren areas. The total number of trees likely to be removed would be 29,950 to 33,775, of which 2,075 to 3,150 would be over 12 inches in diameter (Table 21). Efforts would be made to restore aspen to the former location of the Moose-Wilson Road, which is to be relocated east of Sawmill Ponds; however, the success of these efforts is not assured.

Additional short-term, localized, moderate, adverse impacts would occur where construction disturbs vegetation. With proper and successful regeneration, the long-term, adverse impacts in construction areas would be negligible, although long-term monitoring and control of exotic plants, if found to persist, would need to continue. The number of social trails could be reduced, or their locations altered, which would result in long-term, localized, negligible, beneficial impacts to vegetation that is currently receiving heavy foot traffic. Cumulative impacts would be long term, minor to moderate, and adverse.

No direct or indirect effects to plant species of special concern are expected to result from implementation of Alternative 4.

Because there would be no major, adverse impacts to plant species, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's vegetation resources and no unacceptable impacts.

Hydrology and Water Quality

Methods and Assumptions

Impacts to hydrology and water quality were assessed by examining any expected changes to channel morphology or capacity and the creation of the impervious surface that would create or increase runoff to nearby water bodies or groundwater. Alterations to channel capacity would be introduced by the construction of new bridges to support improved roadway shoulders or separated multi-use pathways. Changes in the quantity of impervious surfaces would be introduced by constructing new hardened shoulders or pathways into the built environment. Increasing the impervious surface creates more potential for storm runoff and non-point source pollutants to enter park surface water and groundwater systems.

Locations of proposed shoulder widening and pathway construction were examined in relation to the location of surface water features and drainage ways. Areas where pathways or shoulder improvements would cross existing drainage ways were identified. For the purposes of this analysis, it was assumed that most crossings could be accommodated via a cantilevered pathway or shoulder attached to the existing bridge structure, and that no modifications to existing abutments would be required that might affect channel capacity, except perhaps in Alternatives 3, 3a, and 4. During preliminary design, however, these assumptions would need to be confirmed by completing a more detailed hydraulic analysis and an application of requirements for permitting. Impacts of creating impervious surfaces were addressed qualitatively since the final design of the pathways and shoulders is not yet complete.

| Impact Threshold Definitions | |
|-------------------------------------|---|
| Negligible | Neither water quality nor hydrology would be affected, or changes would be either nondetectable or, if detected, would have effects that would be considered slight and local. The action would not result in degradation of water quality or impact channel morphology. |
| Minor | Changes in water quality or hydrology would be measurable, although the changes would be small and the effects would be localized. Impacts to water quality would be perceptible but highly localized in one or two sites. No alterations to existing channel capacity or morphology would occur. No mitigation measures associated with water quality or hydrology would be necessary. |
| Moderate | Changes in water quality or hydrology would be measurable but relatively local. Impacts to water quality would be perceptible and/or observable in several locations within the project area. No alterations to existing channel capacity or morphology would occur. Mitigation measures associated with water quality or hydrology would be necessary and the measures would likely succeed. |
| Major | Changes in water quality or hydrology would be readily measurable, would have substantial consequences, and would be noticed on a regional scale. Impacts to water quality would be perceptible throughout the project area. Alterations to existing channel capacity or morphology would occur. Mitigation measures would be necessary and their success would not be guaranteed. |
| Duration | Short term — Following treatment, recovery would take less than 1 year. |
| | Long term — Following treatment, recovery would take longer than 1 year. |
| Area of Analysis | The Snake River and its tributaries that are adjacent to, crossed by, or downstream from proposed actions and the Snake River Valley Aquifer. |

Effects of Alternative 1 — No Action

Under Alternative 1, there would be no direct modifications to channel capacity or levels of nonpoint source pollution. Existing bridges would remain in place along the Snake River and its tributaries. Construction of a separate entrance lane could result in non-point pollution and an increased impervious area; however, this would be localized and BMPs would be put in place to minimize any impacts. Improved signage for pedestrian and wildlife safety and two variable messaging signs would be installed in previously disturbed areas, resulting in negligible short-term impacts to water quality. Non-point source pollution would continue to result from minor oil spills in parking areas, ongoing road maintenance activities, or runoff from unpaved and eroded social trails. However, any maintenance activities would include the implementation of erosion and sedimentation controls and Spill Prevention, Control, and Countermeasure (SPCC) plans, which would limit adverse effects. Impacts of these actions on water quality would be expected to be long term, localized, negligible, and adverse.

Cumulative Impacts

Recent, current, and planned construction projects within Grand Teton National Park that would adversely impact water quality include work on the Murie Ranch, construction of the new Moose Visitor Center and replacement of the Moose Entrance Station, construction of an interpretive center for the LSR Preserve, upgrades to the Jenny Lake Lodge visitor accommodations and employee housing facilities, reconstruction and widening of North Park Road between Lizard Creek Campground and the South Entrance of Yellowstone, replacement of the Snake River Bridge near Flagg Ranch, and the chip-and-seal project from Moran to Jackson Lake Lodge. Widening of North Park Road would affect water quality by increasing the amount of impervious surface along an existing road corridor within the Park. In addition, WYDOT is planning reconstruction of several road segments in the area. One project planned for this area would improve water quality through stabilizing approximately 150 ft (46 m) of the Snake River bank near the float launch area at Moose. This project would produce negligible to minor beneficial impacts within a localized area, given its small size.



None of these facilities would be located in areas where increased recreational use of park waterways would be directly or indirectly affected by their construction. None of these facilities would involve modification of channel capacity or alignment for any of the Park's waterways. Instead, the principal mechanism by which these developments might affect water quality would be by slightly increasing the amount of impervious surface and the potential for runoff and entrance into surface or subsurface waters. Additionally, roadway improvements and construction of a new parking area at Moose would increase opportunities for oil and gasoline spills to be carried into the groundwater, both during the construction process and after implementation. However, spill control and containment measures would be implemented to reduce the chances of any spills reaching surface water or groundwater.

The impacts of these actions, in conjunction with the impacts of Alternative 1, would result in long-term, negligible, adverse cumulative impacts to water quality and hydrology within the Park.

Conclusion

Alternative 1 would result in long-term, localized, negligible, adverse impacts on water quality and hydrology, resulting from continued road maintenance activities, social trail use, and occasional fuel or oil spills at parking areas. Cumulative impacts would be long term, negligible, and adverse.

Because there would be no major, adverse impacts to water resources, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's water resources and no unacceptable impacts.

Effects of Alternative 2 — Improved Road Shoulders

The impacts of Alternative 2 on water quality would be similar to those described for Alternative 1 (i.e., long term, localized, negligible, and adverse). In addition to the actions described for Alternative 1, Alternative 2 includes installation of information kiosks, improved way-finding, and four additional variable messaging signs. The actions would result in localized disturbance in previously disturbed areas and would have short-term, negligible, adverse effects to water quality. Alternative 2 would also provide for shoulder widening along one portion of the Teton Park Road, which includes the crossing of the Snake

River at Moose Junction and the crossing of Cottonwood Creek, Taggart Creek, and several small tributaries along the west side of the Teton Park Road. The small amount of disturbance resulting from the construction of the shoulder would be limited to the areas immediately adjacent to the existing roadway, however, and it is assumed that existing abutments could accommodate the expanded shoulder with no consequences for channel capacity. During final design, a detailed hydraulic study would be undertaken (as needed) to assess the impacts on the stream channel.

This alternative would result in an increase of approximately 12.8 acres (5.2 ha) of impervious surface; however, this would be a small incremental addition located immediately adjacent to the existing roadbed. Long-term, localized, adverse impacts from increased runoff after construction would be negligible. Short-term construction impacts might produce some runoff and non-point source pollution. Grading and surfacing associated with shoulder widening would increase opportunities for sedimentation, as well as leakage of oil and fuels from construction vehicles. Mitigation measures, including placement of erosion-control silt fences and implementation of SPCC measures, would be undertaken to minimize short-term impacts. Given the small amount of shoulder widening involved and the ability to use existing bridgework and abutments for the widening, construction impacts would be short term, localized, negligible to minor, and adverse.

Cumulative Impacts

Impacts of past, current, and reasonably foreseeable future actions would be the same as those for Alternative 1. These projects are estimated to result in minimal changes to hydrology or water quality. The impacts of these actions, in conjunction with the impacts of Alternative 2, would result in negligible, long-term, adverse cumulative impacts to water quality and hydrology within the Park.

Conclusion

Alternative 2 would result in long-term, localized, negligible, adverse impacts on water quality, principally due to a slight increase in impervious surface associated with roadway shoulder facilities and the potential for storm runoff from this area to carry pollutants (e.g., fuels, oil) into the Park's water resources. Short-term impacts associated with construction activities would be localized, negligible to minor, and adverse and with appropriate mitigation, limited to the immediate area of construction. Cumulative impacts would be long term, negligible, and adverse.

Because there would be no major, adverse impacts to water resources, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's water resources and no unacceptable impacts.

Effects of Alternative 3 — Improved Road Shoulders / Multi-Use Pathways

The pathways proposed under Alternative 3 would be generally parallel to the existing road and would consist of a 10-ft (3-m) wide surface and 2-ft (0.6-m) soft shoulders on either side. At least 1 ft (0.3 m) of tree clear zone would extend on either side, in addition to the shoulders, making for a total 16-ft (4.9-m) wide clear corridor. Construction of multi-use pathways outside the road corridor along approximately 23.3 miles (37.3 km) of roads would permanently remove approximately 42.9 acres [17.3 ha] of soils and vegetation and cause temporary disturbance to approximately 42.9 additional acres (17.3 ha). Improving road shoulders along the Teton Park Road and North Park Road between North Jenny Lake Junction and Colter Bay (15.5 miles [25.0 km]) would also permanently remove approximately 18.9 acres (7.6 ha) of soils and vegetation and cause temporary disturbance of another 18.9 acres (7.6 ha) where construction equipment would be used adjacent to the main work area. In total, actions associated with Alternative 3 would cross 16 perennial streams or rivers and 10 intermittent streams; several of which are unnamed.

From the south boundary to North Jenny Lake Junction, the effects to water resources from pathway construction outside the road corridor would be short term, localized, minor, and adverse. The majority of this area is relatively flat and is comprised of mainly sagebrush cover type and therefore erosion from the site and consequently the potential for effects to water quality is expected to be low. The multi-use pathways would cross Ditch Creek and the Gros Ventre River along U.S. Highway 26/89/191 and the Snake River and Cottonwood Creek along the Teton Park Road.

Construction of a multi-use pathway along a portion of the Moose-Wilson Road could require the removal of between 2,925 to 3,725 trees, depending on the specific design, and could result in increased soil erosion in some areas resulting in short-term, localized, minor to moderate, adverse effects to water resources. Pathways along the Moose-Wilson Road would cross Open Canyon and Lake Creek.

Effects to water resources along the Teton Park Road and North Park Road between North Jenny Lake Junction and Colter Bay (15.5 miles [25.0 km]) where shoulder improvements would occur would be short term, localized, negligible to minor, and adverse, and less than pathway construction in this area because construction disturbance would occur in a previously disturbed area immediately adjacent to the existing road. Shoulder widening would occur at the Jackson Lake Dam crossing along Willow Flats and over the East Fork of Pilgrim Creek along North Park Road. Additional named stream crossings would include Beaver Creek, Taggart Creek, Arizona Creek, Lizard Creek, Christian Creek, Spring Creek, and Pilgrim Creek.

If possible, crossings would be accommodated via a cantilevered pathway or shoulder attached to the existing bridge structure, with no consequences for channel capacity and no need to create additional separate bridges for pathways. If cantilevered structures are not feasible, separate bridges would be necessary. During final design, a detailed hydraulic study would be undertaken to assess the impacts of proposed improvements on channel capacity and identify the need for permitting.

Construction of these improved shoulders and pathways is expected to result in approximately 61.8 acres (25.0 ha) of new impervious surface, with the largest share (42.9 acres [17.3 ha]) accounted for by pathway facilities. Long-term indirect impacts from increased runoff to nearby surface drainage and into groundwater would be localized, minor, and adverse.

Short-term construction-related activities might also produce nonpoint source pollution. Grading and surfacing associated with pathway construction in areas adjacent to creeks would increase opportunities for sedimentation, as well as leakage of oil and fuels from construction vehicles. Mitigation measures, including placement of erosion control measures (i.e., silt fence and use of SPCC plans), would be undertaken to minimize short-term impacts. The construction of multi-use pathways cantilevered from existing bridges over larger streams and the Jackson Lake Dam would necessitate placement of formwork and staging of construction activities at the edge of the channel. While construction equipment would be prohibited from the channel, additional mitigation measures, such as placing silt fence barriers and temporarily rerouting channel flows, would be employed to minimize impacts. In each location, short-term impacts would be localized, minor, and adverse.

The Moose-Wilson Road would be realigned in two areas and the existing alignments would be abandoned and



restored to natural conditions. Pavement would be removed and the roadbed would be regraded and revegetated with the intention of restoring aspen and wetland habitat in this area. This would result in the restoration of approximately 5.0 acres (2.0 ha) of soils along the abandoned road alignment, where pavement would be removed and the area graded and reseeded. Approximately 3.9 acres (1.6 ha) of soils would be redisturbed along the new alignment, which follows an old roadbed. The result would be a slight increase in impervious area due to construction of the new segment that would include standard shoulder widths. Effects would be short term, localized, moderate, and adverse during construction.

In addition, under Alternative 3, selected social trails in certain developed areas would be paved or graveled. This would reduce erosion from these trails in the vicinity of Jenny Lake and keep visitors from disturbing new areas that could result in increased runoff and erosion into the lake, a long-term, localized, minor, beneficial impact. Construction of separate entrance lanes and installation of improved signage for pedestrian and wildlife safety and variable messaging signs would have the same effects as those described for Alternative 2.

Cumulative Impacts

Impacts of past, current, and reasonably foreseeable future actions would be the same as those for Alternative 1. These projects are estimated to result in a minimal change to water quality or hydrology. The impacts of these related actions, in conjunction with the adverse and beneficial impacts of Alternative 3, would result in long-term, negligible, adverse cumulative impacts to water quality and hydrology within the Park.

Conclusion

Alternative 3 would result in long-term, localized, minor, adverse impacts on water quality, principally due to the increase in impervious surface associated with pathway and roadway shoulder facilities and the potential for storm runoff from these facilities to carry pollutants (e.g., fuels, oil) into the groundwater. Long-term, localized, minor, beneficial impacts would result from the paving and stabilization of social trails in the vicinity of Jenny Lake. Short-term impacts associated with construction activities would be minor and adverse and with appropriate mitigation, limited to the immediate area of construction. Cumulative impacts would be long-term, negligible, and adverse.

Because there would be no major, adverse impacts to water resources, for which conservation is (1) necessary

to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's water resources and no unacceptable impacts.

Effects of Alternative 3a — Preferred Alternative

Stream crossings under Alternative 3a would include Beaver Creek, Taggart Creek, Arizona Creek, Lizard Creek, Christian Creek, Ditch Creek, the Gros Ventre River, the Snake River, Cottonwood Creek, Pilgrim Creek, and Spring Creek. The main differences between Alternative 3 and Alternative 3a are as follows: Alternative 3a includes the addition of pathway spurs in two areas (North Jenny Lake Junction to String Lake and along Sagebrush Road and Spring Gulch Drive), construction of a pathway within the road corridor rather than a widened shoulder from North Jenny Lake Junction to Colter Bay, and construction of a pathway within the road corridor along a portion of the Moose-Wilson Road rather than outside the road corridor. While impacts to water resources in these areas would be greater than under Alternative 3, the increase is expected to be negligible. In total, actions associated with Alternative 3a would cross 16 perennial streams or rivers and 10 intermittent streams; several of these streams are unnamed.

Construction of multi-use pathways outside the road corridor (along approximately 22.5 miles [36.0 km]) and pathways inside the road corridor (along approximately 18.8 miles [30.3 km]) would be a new feature and would permanently remove approximately 75.9 acres (30.7 ha) of soils and vegetation and cause temporary disturbance to approximately 75.9 additional acres (30.7 ha).

From the south boundary to North Jenny Lake Junction, the effects from construction of multi-use pathways outside the road corridor would be the same as described for Alternative 3 (i.e., localized and minor), except for the pathway spurs. The spurs are proposed in two areas along this segment: North Jenny Lake Junction to String Lake and along Sagebrush Drive and Spring Gulch Road. While impacts to water resources in these areas would be greater than under Alternative 3, the overall effects would still be short term, localized, minor, and adverse. The multi-use pathways would cross Ditch Creek and the Gros Ventre River along U.S. Highway 26/89/191 and the Snake River and Cottonwood Creek along the Teton Park Road.

Construction of multi-use pathways within the road corridor between North Jenny Lake Junction and Colter

Bay (15.5 miles [25.0 km]) would have potentially short-term, localized, moderate, and adverse effects on water quality because of construction within the road corridor. Due to the terrain, pathway construction in this area would require cut and fill actions. In addition, approximately 11.0 acres (4.5 ha) of vegetation removal within the road corridor would likely be required in this area, and another 11.0 acres (4.5 ha) would be temporarily disturbed where construction equipment would be used adjacent to the main work area. Shoulder widening would occur between Signal Mountain Lodge and Jackson Lake Dam, at Jackson Lake Dam crossing along Willow Flats, and over the East Fork of Pilgrim Creek along North Park Road. Separate bridge crossings would be constructed at Christian Creek and Pilgrim Creek.

Construction of a multi-use pathway within the road corridor along a portion of the Moose-Wilson Road could require the removal of 2,150 to 2,900 trees, depending on the specific design, and could affect water quality. Less vegetation removal would be required than under Alternative 3 because the pathway would be constructed within rather than outside the road corridor. Although the pathway would be designed and sited to minimize effects, soil disturbance would occur and could result in impacts to water quality in some areas. Effects are expected to be short-term, localized, minor, and adverse. Pathways along the Moose-Wilson Road would cross Open Canyon and Lake Creek.

Construction of multi-use pathways and road shoulders is expected to result in approximately 76.0 acres (31.0 ha) of new impervious surface. Short-term, construction-related activities might also produce nonpoint source pollution. Grading and surfacing associated with pathway construction in areas adjacent to creeks would increase opportunities for sedimentation, as well as leakage of oil and fuels from construction vehicles. Mitigation measures, including placement of erosion control measures such as silt fences and use of SPCC plans, would be undertaken to minimize short-term impacts. The construction of multi-use pathways cantilevered from existing bridges over larger streams and the Jackson Lake Dam would necessitate placement of formwork and staging of construction activities at the edge of the channel. Separate bridge crossings at Christian Creek, and particularly at Pilgrim Creek, have the potential to impact existing channel capacity or morphology. While construction equipment would be prohibited from the channel, additional mitigation measures (i.e., placing silt fence barriers and temporarily rerouting channel flows) would be employed

to minimize impacts. In each location, short-term impacts would be localized, minor, and adverse.

The Moose-Wilson Road would be realigned in two areas, and the existing alignments would be abandoned and restored to natural conditions. Pavement would be removed and the roadbed would be regraded and revegetated with the intention of restoring aspen and wetland habitat in this area. This would result in the restoration of approximately 5.0 acres (2.0 ha) of soils along the abandoned road alignment where pavement would be removed and the area graded and reseeded. Approximately 3.9 acres (1.6 ha) of soils would be redisturbed along the new alignment, which follows an old roadbed. The result would be a slight increase in impervious area due to construction of the new segment that would include standard shoulder widths. Effects would be short term, localized, moderate, and adverse during construction.

In addition, under Alternative 3a, selected social trails in certain developed areas would be paved or graveled. This would reduce erosion from these trails in the vicinity of Jenny Lake and keep visitors from disturbing new areas that could result in increased runoff and erosion into the lake, a long-term, localized, minor, beneficial impact. Construction of separate entrance lanes and installation of improved signage for pedestrian and wildlife safety and variable messaging signs would have the same effects as those described for Alternative 2.

Cumulative Impacts

Impacts of past, current, and reasonably foreseeable future actions would be the same as those for Alternative 1. These projects are estimated to result in a minimal change to water quality or hydrology. The impacts of these related actions, in conjunction with the adverse and beneficial impacts of Alternative 3a, would result in long-term, minor, adverse cumulative impacts to water quality and hydrology within the Park.

Conclusion

Alternative 3a would result in long-term, localized, minor, adverse impacts on water quality, principally due to the construction of separate bridges over Christian and Pilgrim Creeks; the increase in impervious surface associated with pathway and roadway shoulder facilities; and the potential for storm runoff from these facilities to carry pollutants (fuels, oil) into the groundwater. Long-term, localized, minor, beneficial impacts would result from the paving and stabilization of social trails. Short-term impacts associated with construction activities would be minor and adverse



and with appropriate mitigation, limited to the immediate area of construction. Cumulative impacts would be long term, negligible, and adverse.

Because there would be no major, adverse impacts to water resources, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's water resources and no unacceptable impacts.

Effects of Alternative 4 — Multi-Use Pathways

Stream crossings under Alternative 4 would include Beaver Creek, Taggart Creek, Arizona Creek, Open Canyon, Lake Creek, Lizard Creek, Christian Creek, Ditch Creek, the Gros Ventre River, the Snake River, Cottonwood Creek, Pilgrim Creek, and Spring Creek. The main differences between Alternative 3a and Alternative 4 are as follows: Alternative 4 includes the construction of multi-use pathways outside the road corridor rather than within the road corridor from North Jenny Lake Junction to Colter Bay, and construction of multi-use pathways outside the road corridor along the entire the Moose-Wilson Road rather than just to the LSR Preserve. In addition, the pathway spurs to String Lake and along Sagebrush Road and Spring Gulch Drive would not be constructed under Alternative 4. In total, actions associated with Alternative 4 would cross 16 perennial streams or rivers and 10 intermittent streams; several of which are unnamed.

Under Alternative 4, construction of multi-use pathways outside the road corridor along approximately 42.6 miles (68.4 km) of roads would be a new feature and would permanently remove approximately 81.0 acres (33.0 ha) of soils and vegetation and cause temporary disturbance to approximately 81.0 additional acres (33.0 ha).

From the south boundary to North Jenny Lake Junction, the effects from construction of multi-use pathways outside the road corridor would be the same as for Alternative 3 (i.e., localized and minor). The multi-use pathways would cross Ditch Creek and the Gros Ventre River along U.S. Highway 26/89/191 and the Snake River and Cottonwood Creek along the Teton Park Road.

Construction of multi-use pathways outside the road corridor between North Jenny Lake Junction and Colter Bay has the potential for removal of large amounts of vegetation (26.0 acres [10.5 ha]) in this area, which

could lead to soil erosion and localized effects on water resources. Shoulder widening would occur at the Jackson Lake Dam crossing along Willow Flats, and over the East Fork of Pilgrim Creek, along North Park Road. Separate bridge crossings would be constructed at Christian Creek and Pilgrim Creek. Short-term, localized, minor to moderate, adverse effects to water resources could occur.

Construction of a multi-use pathway outside the road corridor along the entire the Moose-Wilson Road could require the removal of 6,375 to 7,575 trees, depending on the specific design, and could result in increased soil erosion in some areas, resulting in minor to moderate effects to water resources. Approximately 9.9 acres (4.0 ha) of vegetation would also be removed along this road section and an additional 9.9 acres (4.0 ha) would be temporarily disturbed by construction equipment. Pathways along the entire the Moose-Wilson Road would cross several creeks, including Open Canyon and Lake Creek.

Construction of multi-use pathways is expected to result in approximately 81.0 acres (33.0 ha) of new impervious surface. Short-term, construction-related activities might also produce nonpoint source pollution. Grading and surfacing associated with pathway construction in areas adjacent to creeks would increase opportunities for sedimentation, as well as leakage of oil and fuels from construction vehicles. Mitigation measures, including placement of erosion control measures (i.e., silt fences and use of SPCC plans), would be undertaken to minimize short-term impacts. The construction of multi-use pathways cantilevered from existing bridges over larger streams and the Jackson Lake Dam would necessitate placement of formwork and staging of construction activities at the edge of the channel. Separate bridge crossings at Christian Creek, and particularly at Pilgrim Creek, have the potential to impact existing channel capacity or morphology. While construction equipment would be prohibited from the channel, additional mitigation measures (i.e., placing silt fence barriers and temporarily rerouting channel flows) would be employed to minimize impacts. In each location, short-term impacts would be localized, minor, and adverse.

The Moose-Wilson Road would be realigned in two areas, and the existing alignments would be abandoned and restored to natural conditions. Pavement would be removed and the roadbed would be regraded and revegetated with the intention of restoring aspen and wetland habitat in this area. This would result in the

restoration of approximately 5.0 acres (2.0 ha) of soils along the abandoned road alignment (where pavement would be removed and the area graded and reseeded).

Approximately 3.9 acres

(1.6 ha) of soils would be redisturbed along the new alignment, which follows an old roadbed. The result would be a slight increase in impervious area due to construction of the new segment that would include standard shoulder widths. Effects would be short term, localized, moderate, and adverse during construction.

In addition, under Alternative 4, selected social trails in certain developed areas would be paved or graveled. This would reduce erosion from these trails in the vicinity of Jenny Lake and keep visitors from disturbing new areas that could result in increased runoff and erosion into the lake, a long-term, localized, minor, beneficial impact. Construction of separate entrance lanes and installation of improved signage for pedestrian and wildlife safety and variable messaging signs would have the same effects as those described for Alternative 2.

Cumulative Impacts

Impacts of past, current, and reasonably foreseeable future actions would be the same as those for Alternative 1. These projects are estimated to result in a minimal change to water quality or hydrology. The impacts of these related actions, in conjunction with the adverse and beneficial impacts of Alternative 4, would result in long-term, minor, adverse cumulative impacts to water quality and hydrology within the Park.

Conclusion

Alternative 4 would result in long-term, localized, minor to moderate, adverse impacts on water quality, principally due to the construction of separate bridges over Christian and Pilgrim Creeks; the increase in impervious surface associated with pathway facilities; and the potential for storm runoff from these facilities to carry pollutants (fuels, oil) into the groundwater. Long-term, localized, minor, beneficial impacts would result from the paving and stabilization of social trails. Short-term impacts associated with construction activities would be minor and adverse and with appropriate mitigation, limited to the immediate area of construction. Cumulative impacts would be long term, negligible, and adverse.

Because there would be no major, adverse impacts to water resources, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to the

natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's water resources and no unacceptable impacts.

Wetlands

Methods and Assumptions

Wetland presence within the project area was estimated using aerial photography, 1990 NWI mapping, 1982 soil survey mapping, 2002 land cover type classification, and several historic wetland delineations, as described in Chapter 3. Temporary and permanent wetland impacts were calculated by correlating wetland locations with locations of proposed actions. However, because precise wetland locations, pathway locations, and engineering specifications have not been determined at this time, wetland impacts described should be considered professional estimates.

Table 18 provides a summary of direct impacts (acres) to potential wetland areas by alternative and road segment. The table was derived using a Geographic Information System (GIS) analysis, which overlaid alternatives onto habitat classifications of cottonwood, pond, stream, wet meadow, and willow (all of which have the potential to be wetlands). The GIS analysis was designed to calculate the number of potential wetland acres directly affected by each road/pathway segment within each alternative. It was discovered in preparation of the Final Plan/EIS that an error had been made during the calculation of acreages of wetlands that would be impacted associated with each alternative in the Draft Plan/EIS. Table 18 presents the correct acreages potentially impacted by each alternative.



| Impact Threshold Definitions | |
|-------------------------------------|---|
| Negligible | Wetlands area or function would not be affected, or changes would be either nondetectable, or if detected, would have effects that would be considered slight, local, and would likely be short term. |
| Minor | Wetlands function would not be affected; however, effects to a few individual plant or wildlife species would be measurable. Changes would be small, localized, and short term. No mitigation measures would be necessary. |
| Moderate | Wetlands function would be affected. Changes would be measurable and long-term, but localized, with all wetland species remaining indefinitely viable within the Park. Mitigation measures would be necessary and likely successful. |
| Major | Wetlands function would be affected permanently. Changes would be readily measurable, long-term, and have consequences on a regional scale. Wetland species dynamics would be upset and species would be at risk of expiration from the Park. Mitigation measures would be necessary and their success would not be guaranteed. |
| Duration | Short term — Recovers in less than 3 years. |
| | Long term — Takes more than 3 years to recover. |
| Area of Analysis | Within park boundary. |

Effects of Alternative 1 — No Action

Under Alternative 1, there would be no actions that would result in impacts to wetlands other than routine road maintenance conducted in the vicinity of wetlands crossed by roads. With the application of appropriate mitigation, including avoidance, erosion and sedimentation control, noxious weed control, and use of construction (as needed), no new loss of wetlands would result from the implementation of Alternative 1, and long-term, adverse impacts (direct or indirect) would be negligible and localized.

Cumulative Impacts

Historic and current park management philosophies emphasize wetland protection, and no existing and future development activities occurring within Grand Teton National Park are expected to adversely impact wetlands to any large degree. Some wetlands have been altered or lost because of past activities; however, the extent of these impacts is unknown. For example, it appears that several springs and associated wetlands located along the toe of the Beaver Creek Bench on the Moose-Wilson Road have been filled and modified in the past because of road construction. Similarly, the flood control levee located along the Snake River east of the Moose-Wilson Road appears to have filled wetlands and altered the hydrology of the area sufficiently to adversely affect adjacent wetlands, as well as those in the vicinity. GIS analysis indicates that approximately 9.2 acres (3.7 ha) of potential wetlands may have been impacted by the present road configuration.

Ongoing and recently completed projects in Grand Teton National Park that would impact wetlands include:

1. Widening and reconstruction of 10.5 miles (16.9 km) of North Park Road (0.9 acre [0.4 ha] of wetland impacts, 3.2 acres [1.3 ha] of wetland mitigation).
2. Widening and rehabilitation of 7.7 miles (12.4 km) of U.S. Highway 26/89/191 (0.3 acre [0.1 ha] of wetland impacts, no mitigation).
3. Spread Creek Material Source and Staging Area Project (0.01 acre [0.004 ha] of wetland impacts).

Environmental assessments and findings of no significant impact associated with these projects addressed impacts to wetlands. In addition to those mentioned specifically above, WYDOT is always planning road reconstruction projects that have the potential to impact wetlands; however, the extent is presently unknown.

The wetland impacts of these other actions, when combined with the negligible wetland impacts resulting from Alternative 1, would result in long-term, negligible to minor adverse impacts to wetlands mainly associated with maintaining small but permanent wetland fills along existing roads that contribute negligibly overall to cumulative impacts to wetlands.

Conclusion

Alternative 1 would result in long-term, localized, negligible, adverse impacts to wetlands, with no new or measurable net wetland losses. Cumulative impacts would be long-term, negligible to minor, and adverse.

Because there would be no major, adverse impacts to wetlands, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's wetlands and no unacceptable impacts.

Effects of Alternative 2 — Improved Road Shoulders

Alternative 2 would have similar impacts to wetlands (as described for Alternative 1 relating to continued road maintenance), with a slight addition to adverse effects from the shoulder widening along the Teton Park Road in the vicinity of Cottonwood Creek, Taggart Creek, and the Snake River, where palustrine-scrub/shrub and emergent wetlands are present. There is the potential for wetland impacts to occur northeast of Jackson Lake Dam, where the Teton Park Road bisects Willow Flats, a large expanse of palustrine-scrub/shrub wetlands. Wetland impacts would primarily be associated with wetland fills that would be required to construct improved shoulders along this portion of the road. Approximately 0.02 acres (0.008 ha) of wetlands would potentially be affected (see Table 18). However, because shoulder construction would occur without any expansion of the current bridges, potential impacts would be minimized or avoided completely. Actions under Alternative 2 would result in long-term, localized, negligible to minor, adverse impacts to wetlands.

Cumulative Impacts

Cumulative impacts to wetlands associated with Alternative 2 would be generally the same as those identified in Alternative 1 because wetlands would be avoided during shoulder construction along existing roadways. If any wetlands were disturbed, wetland mitigation requirements would ultimately result in total replacement and a possible net increase in park wetlands that are similar in type and function to impacted wetlands. Human uses of linear facilities resulting from implementing Alternative 2, including vehicles, are not expected to contribute to cumulative impacts in any measurable way.

The wetland impacts of other actions (described in Alternative 1), when combined with wetland impacts resulting from Alternative 2, would result in long-term, negligible to minor, adverse impacts to wetlands mainly associated with the small but permanent wetland fills that contribute negligibly overall to cumulative impacts to wetlands.

Conclusion

Alternative 2 would result in long-term, localized, negligible to minor, adverse impacts on Grand Teton National Park wetlands. Permanent losses of wetlands would be avoided, minimized, and if necessary, compensated for at a minimum ratio of 1:1. Construction activities would employ BMPs to reduce or largely eliminate any adverse effects to adjacent and nearby wetlands. Cumulative impacts to wetlands would be long term, negligible to minor, and adverse.

Because there would be no major, adverse impacts to wetlands, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's wetlands and no unacceptable impacts.

Effects of Alternative 3 — Improved Road Shoulders / Multi-Use Pathways

Alternative 3 would affect a small portion of palustrine-scrub/shrub, emergent, and aquatic bed wetlands within the project area if wetlands cannot be totally avoided during construction in certain areas, such as Willow Flats. Wetland impacts would primarily be associated with improved shoulders planned for north of Jenny Lake to Colter Bay, which would involve crossing Willow Flats and the Pilgrim Creek area. Construction of the multi-use pathways through or adjacent to wetlands could affect wetlands by altering or obstructing groundwater and surface water regimes, altering wetland connectivity, and changing chemical and biological characteristics. Potential impacts would be minimized or eliminated by using cantilevered additions to existing bridges, if feasible, and by placing multiple culverts through a separated pathway, if needed. Any long-term adverse impacts following mitigation would be minor and localized.

The majority of wetland impacts that could occur under Alternative 3 would affect palustrine-scrub/shrub wetlands and palustrine emergent wetlands associated with the stream crossings at Ditch Creek, Taggart Creek, Cottonwood Creek, Snake River, Gros Ventre River, Arizona Creek, Lizard Creek, Christian Creek, Spring Creek, and Pilgrim Creek. Approximately 0.12 acres (0.05 ha) of wetlands could potentially be impacted by roadway features and 1.28 acres (0.52 ha) could potentially be impacted by pathways (see Table 18). Wetland impacts not associated with stream crossings would be greatest in the area from Jackson Lake



Dam to Jackson Lake Junction. Additional wetland impacts would be located in small, localized areas adjacent to Jackson Lake and Cottonwood Creek and along the Moose-Wilson Road realignment. Wetland impacts would occur mainly along existing transportation corridors; however, the exact alignment of the multi-use pathways has not yet been determined. In all areas where construction would potentially affect wetlands, mitigation measures would be implemented to preserve wetland functions and values, as well as to control erosion, noxious weeds, and spills of any construction-related fuels. Impacts would be long-term, localized, minor, and adverse.

The Moose-Wilson Road would be realigned in two areas, and the existing alignments would be abandoned and restored to natural conditions. Specifically, a section of the existing Moose-Wilson Road between Sawmill Ponds Overlook and a point approximately one-third mile (0.5 km) north of Death Canyon Road junction would be abandoned and restored to natural conditions. Realignment would occur for the purpose of restoring aspen habitat to this area and avoiding important wetland and riparian areas. The aspen, cottonwood, and mixed deciduous-coniferous forests and wetlands located along this section of the Moose-Wilson Road provide unique habitat for wildlife and distinct vegetative communities. This action would result in long term, localized, minor to moderate, beneficial impacts.

Improvements to several social trails in the vicinity of Jenny Lake would have no direct impacts on wetlands since these trails are not located in wetlands. There would be indirect, long-term, localized, negligible, beneficial impacts to wetlands by eliminating runoff from eroded trails into nearby wetlands that border Jenny Lake.

Cumulative Impacts

Cumulative impacts to wetlands associated with Alternative 3 would be generally the same as those identified in Alternative 1, with only a small incremental effect expected from construction of multi-use pathways in certain areas. Wetland mitigation requirements would ultimately result in total replacement and a possible net increase in park wetlands that are similar in type and function to impacted wetlands. Human uses of linear facilities resulting from implementing Alternative 3, including vehicles, are not expected to contribute to cumulative impacts in any measurable way.

The wetland impacts of other actions (described in Alternative 1), when combined with wetland impacts resulting from Alternative 3, would result in long-term, localized, negligible to minor, adverse impacts to wetlands

associated mostly with the small but permanent wetland fills that contribute negligibly overall to cumulative impacts to wetlands.

Conclusion

Alternative 3 would result in long-term, localized, minor, adverse impacts on Grand Teton National Park wetlands, mainly in the vicinity of Cottonwood Creek and Willow Flats, with long-term, localized, negligible, beneficial impacts due to improving social trails and long term, localized, minor to moderate, beneficial impacts from realignment of the Moose-Wilson Road. Permanent losses of wetlands would be avoided, minimized, and if necessary, compensated for at a minimum ratio of 1:1. Construction activities would employ BMPs to reduce or largely eliminate any adverse effects to adjacent and nearby wetlands. Cumulative impacts would be long-term, negligible to minor, and adverse.

Because there would be no major, adverse impacts to wetlands, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's wetlands and no unacceptable impacts.

Effects of Alternative 3a — Preferred Alternative

Alternative 3a would affect a small portion of palustrine-scrub/shrub, emergent, and aquatic bed wetlands within the project area if wetlands cannot be totally avoided during construction in certain areas, such as Willow Flats. Wetland impacts would primarily be associated with the creation of separated pathways from the Granite Canyon Entrance Station to the LSR Preserve on the Moose-Wilson Road; the south boundary to Antelope Flats Road; along the Teton Park Road from Moose Junction to North Jenny Lake Junction; and on to String Lake along the Jenny Lake Road. Construction of the multi-use pathways through or adjacent to wetlands could affect wetlands by altering or obstructing groundwater and surface water regimes, altering wetland connectivity, and changing chemical and biological characteristics. Potential impacts would be minimized or eliminated by using cantilevered additions to existing bridges, if feasible, and by placing multiple culverts through a separated pathway, if needed. Any long-term adverse impacts following mitigation would be minor and localized.

Approximately 3.85 acres (1.56 ha) of potential wetlands would be affected under this alternative (see Table 18). The majority of wetland impacts that could occur under Alternative 3a would affect palustrine-scrub/shrub wetlands and palustrine emergent wetlands associated with the stream crossings at Ditch Creek, Taggart Creek, Cottonwood Creek, Snake River, Gros Ventre River, Arizona Creek, Lizard Creek, Christian Creek, Spring Creek, Pilgrim Creek, Open Canyon Creek, and Lake Creek. Wetland impacts would be greatest in the section from Jackson Lake Dam to Jackson Lake Junction. Additional wetland impacts would be located in small, localized areas adjacent to Jackson Lake and along the segments of the Moose-Wilson Road realignment. Wetland impacts would occur mostly along existing transportation corridors; however, the exact alignment of the multi-use pathways has not yet been determined. In all areas where wetlands would potentially be affected to complete construction, mitigation measures would be implemented to preserve wetland functions and values, as well as to control erosion, noxious weeds, and spills of any construction-related fuels. Impacts would be long-term, localized, minor to moderate, and adverse.

The Moose-Wilson Road would be realigned in two areas, and the existing alignments would be abandoned and restored to natural conditions. Specifically, a section of the existing Moose-Wilson Road between Sawmill Ponds Overlook and a point approximately one-third mile (0.5 km) north of Death Canyon Road junction would be abandoned and restored to natural conditions. Realignment would occur for the purpose of restoring aspen habitat to this area and avoiding important wetland and riparian areas. The aspen, cottonwood, and mixed deciduous-coniferous forests and wetlands located along this section of the Moose-Wilson Road provide unique habitat for wildlife and distinct vegetative communities. This action would result in long term, localized, minor to moderate, beneficial impacts.

Improvements to several social trails in the vicinity of Jenny Lake would have no direct impacts on wetlands since these trails are not located in wetlands. There would be indirect long-term, localized, negligible, beneficial impacts to wetlands by eliminating runoff from eroded trails into nearby wetlands that border Jenny Lake.

Cumulative Impacts

Cumulative impacts to wetlands associated with Alternative 3a would be generally the same as those identified in Alternative 3, with an increased effect expected from construction of multi-use pathways from the Granite Canyon Entrance Station to the LSR Preserve on the Moose-Wilson Road; and multi-use pathways rather than improved shoulders from North Jenny Lake to Colter Bay. Wetland mitigation requirements would ultimately result in total replacement and a possible net increase in park wetlands that are similar in type and function to impacted wetlands. Human uses of linear facilities resulting from implementing Alternative 3a, including vehicles, are not expected to contribute to cumulative impacts in any measurable way.

The wetland impacts of other actions (described in Alternative 1), when combined with wetland impacts resulting from Alternative 3a, would result in long-term, negligible to minor, adverse impacts to wetlands associated mostly with the small but permanent wetland fills that contribute negligibly overall to cumulative impacts to wetlands.

Conclusion

Alternative 3a would result in long-term, localized, minor to moderate, adverse impacts to Grand Teton National Park wetlands, mainly in the vicinity of Cottonwood Creek and the area from Jackson Lake Dam to Jackson Lake Junction, with long-term, localized, negligible, beneficial impacts due to improving social trails and long-term, localized, minor to moderate, beneficial impacts from realignment of the Moose-Wilson Road. Permanent losses of wetlands would be avoided, minimized, and if necessary, compensated for at a minimum ratio of 1:1. Construction activities would employ BMPs to reduce or largely eliminate any adverse effects to adjacent and nearby wetlands. Cumulative impacts would be long-term, negligible to minor, and adverse.

Because there would be no major, adverse impacts to wetlands, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's wetlands and no unacceptable impacts.



Effects of Alternative 4 — Multi-Use Pathways

Alternative 4 would affect a small portion of palustrine-scrub/shrub, emergent, and aquatic bed wetlands within the project area if wetlands cannot be totally avoided during construction in certain areas, such as Willow Flats. Wetland impacts would primarily be associated with the creation of multi-use pathways from North Jenny Lake to Colter Bay; the south boundary to Antelope Flats Road; and from the Granite Canyon Entrance Station to Moose. Construction of the multi-use pathways through or adjacent to wetlands could affect wetlands by altering or obstructing groundwater and surface water regimes, altering wetland connectivity, and changing chemical and biological characteristics. Potential impacts would be minimized or eliminated by using cantilevered additions to existing bridges, if feasible, and by placing multiple culverts through a separated pathway, if needed. Any long-term adverse impacts following mitigation would be minor and localized.

Approximately 4.26 acres (1.72 ha) of potential wetlands would be affected by this alternative (see Table 18). The majority of wetland impacts that could occur under Alternative 4 would affect palustrine-scrub/shrub wetlands and palustrine emergent wetlands associated with the stream crossings at Ditch Creek, Taggart Creek, Cottonwood Creek, Snake River, Gros Ventre River, Arizona Creek, Lizard Creek, Christian Creek, Spring Creek, Pilgrim Creek, Open Canyon Creek, and Lake Creek. Wetland impacts would be greatest in the section from Jackson Lake Dam to Jackson Lake Junction. Additional wetland impacts would be located in small, localized areas adjacent to Jackson Lake and along the segments of the Moose-Wilson Road realignment. Wetland impacts would occur mostly along existing transportation corridors; however, the exact alignment of the multi-use pathways has not yet been determined. The exact locations where pathways would be constructed are unknown; therefore, calculations for disturbance values address the greatest potential disturbance. Actual disturbance would be less than the estimated 4.26 acres (1.72 ha). In all areas where wetlands would potentially be affected to complete construction, mitigation measures would be implemented to preserve wetland functions and values, as well as to control erosion, noxious weeds, and spills of any construction-related fuels. Impacts would be long term, localized, minor to moderate, and adverse.

As in Alternatives 3 and 3a, the Moose-Wilson Road would be realigned in two areas, and the existing alignments

would be abandoned and restored to natural conditions. Specifically, a section of the existing Moose-Wilson Road between Sawmill Ponds Overlook and a point approximately one-third mile (0.5 km) north of Death Canyon Road junction would be abandoned and restored to natural conditions. Realignment would occur for the purpose of restoring aspen habitat to this area and avoiding important wetland and riparian areas. The aspen, cottonwood, and mixed deciduous-coniferous forests and wetlands located along this section of the Moose-Wilson Road provide unique habitat for wildlife and distinct vegetative communities. This action would result in long term, localized, minor to moderate, beneficial impacts.

Improvements to several social trails in the vicinity of Jenny Lake would have no direct impacts on wetlands since these trails are not located in wetlands. There would be indirect long-term, localized, negligible, beneficial impacts to wetlands by eliminating runoff from eroded trails into nearby wetlands that border Jenny Lake.

Cumulative Impacts

Cumulative impacts to wetlands associated with Alternative 4 would be the same as those identified in Alternatives 3 and 3a for the south boundary to North Jenny Lake Road segment; and slightly greater than Alternatives 3 and 3a for the North Jenny Lake to Colter Bay road segment and the Granite Canyon Entrance Station to Moose road segment. This increased effect is expected from construction of multi-use pathways from the Granite Canyon Entrance Station to Moose rather than from the Granite Canyon Entrance Station to the LSR Preserve, as in Alternatives 3 and 3a, and from construction of multi-use pathways outside the road corridor rather than improved shoulders or pathways within the road corridor from North Jenny Lake to Colter Bay. Wetland mitigation requirements would ultimately result in total replacement and a possible net increase in park wetlands that are similar in type and function to impacted wetlands. Human uses of linear facilities resulting from implementing Alternative 4, including vehicles, are not expected to contribute to cumulative impacts in any measurable way.

The wetland impacts of other actions (described in Alternative 1), when combined with wetland impacts resulting from Alternative 4, would result in long-term, negligible to minor, adverse impacts to wetlands associated mostly with the small but permanent wetland fills that contribute negligibly overall to cumulative impacts to wetlands.

Conclusion

Alternative 4 would result in long-term, localized, minor to moderate, adverse impacts to Grand Teton National Park wetlands, mainly in the vicinity of Cottonwood Creek and the area from Jackson Lake Dam to Jackson Lake Junction, with long-term, localized, negligible, beneficial impacts due to improving social trails and long-term, localized, minor to moderate, beneficial impacts from realignment of the Moose-Wilson Road. Permanent losses of wetlands would be avoided, minimized, and if necessary, compensated for at a minimum ratio of 1:1. Construction activities would employ BMPs to reduce or largely eliminate any adverse effects to adjacent and nearby wetlands. Cumulative impacts would be long-term, negligible to minor, and adverse.

Because there would be no major, adverse impacts to wetlands, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's wetlands and no unacceptable impacts.

Threatened and Endangered Species, Species of Special Concern, Neotropical Migratory Birds, and General Wildlife

Methods and Assumptions

This section addresses impacts to endangered and threatened animal species, bird species of special concern, neotropical migratory birds, and general wildlife (i.e., mammals, reptiles, and amphibians).

Effects of transportation routes, features, and improvements on terrestrial wildlife (including threatened and endangered species) have been documented (Trombulak and Frissell 2000; Forman et al. 2003) and include such impacts as mortality from collisions, modification of animal behavior, disruption of the physical environment, spread of exotic species, and changes in human use of the lands and water. Specific examples include habitat loss and fragmentation, reduced animal use of habitats because of noise and/or the presence of humans, loss of forage, interference with wildlife life-history functions (e.g., courtship, nesting, and migration), spread of non-native species carried by vehicles, and increased levels of recreation.

The level of impact relates, in part, to the density of transportation features, the physical footprint and effect zone of the transportation network, availability of secure habitat areas, and traffic volume. Grand Teton National Park is approximately 484 square miles (1,254 square km) in size, and there are roughly 350 miles (563 km) of transportation routes within the Park. This represents an average transportation-route density of 0.7 mile per square mile (0.45 km per square kilometer) for the entire park. Road density is scale-dependent and would be higher or lower than the average figure reported here in some portions of the Park. The approximate physical footprint of the road system is 0.8 square miles (2.1 square km), which is less than 1 percent of the total park area.

The following sources of information were used to assess project impacts to wildlife, including threatened, endangered, and sensitive species:

- Scientific literature on species life histories, distributions, habitat selection, and responses to human activities.
- Site-specific information on wildlife distribution and use patterns within Grand Teton National Park and its vicinity, including complete and ongoing studies (when available) and the professional judgment of park, other federal, state, or non-agency biologists familiar with the status and management concerns related to individual species.

The impact analyses considered a variety of factors, including known or likely presence of the species in the areas that would be affected by actions under each alternative, and presence of the species' preferred habitat. Factors considered included habitat loss or disturbance, direct mortality, human-caused disturbance (e.g., noise, traffic volumes, and human use patterns), and habitat fragmentation.

For purposes of Section 7 consultation with the USFWS, the impact assessments for federally listed species also include a concluding statement for each federally listed species as to whether the alternative would have "No Effect," "May Affect but is Not Likely to Adversely Affect," or "May Affect and is Likely to Adversely Affect." Review of this document and the impact analysis is intended to serve as the Biological Assessment in support of the Section 7 formal consultation process.



| Impact Threshold Definitions | |
|--|---|
| Threatened and Endangered Species (Federally Listed Species) | |
| No Effect | A federally listed species would not be affected. |
| Minor | Analogous to a “May-Affect-but-Not-Likely-to-Adversely Affect” determination used by the USFWS. Implementing the alternative could possibly affect, but is not likely to adversely affect, a listed species or its critical habitat. Mitigation measures would be needed in order to attain the “Not-Likely-to-Adversely-Affect” determination. |
| Moderate | Analogous to a “May Affect but Not Likely to Adversely Affect” determination used by the USFWS or to a “May Affect and Likely to Adversely Affect” determination when an action could affect one or more individual members of a listed species and/or its critical habitat, but when the action would not threaten the survival of the species. Mitigation measures would likely be required to reduce impacts. |
| Major | Analogous to a “May Affect and Likely to Adversely Affect” determination used by the USFWS when an action could affect one or more individual members of a listed species and/or its critical habitat; and when the action could threaten the survival of the species and/or its critical habitat. Mitigation measures would likely be required to reduce impacts, or the action could result in a “Jeopardy Opinion” given by the USFWS. |
| Duration | Short term — recovers in less than 1 year. |
| | Long term — requires more than 1 year to recover. |
| Area of Analysis | Within the Park and surrounding GYA. |
| Species of Special Concern, Neotropical Migratory Birds, and General Wildlife | |
| Negligible | A small number of individual animals and/or a small amount of their respective habitat would be adversely affected via direct or indirect impacts associated with a given alternative. Populations would not be affected or the effects would be below a measurable level of detection. Mitigation measures would not be warranted. |
| Minor | Effects to individual animals and/or their respective habitats would be more numerous and detectable. Populations would not be affected or the effects would be below a measurable level of detection. Mitigation measures would be needed and would be successful in reducing adverse effects. |
| Moderate | Effects to 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. |
| Major | Effects to individual animals and their habitat would be obvious and would have substantive consequences on a regional population level. Extensive mitigation measures would be needed to reduce any adverse effects and their success would not be guaranteed. |
| Duration | Short term — Impact has a duration less than or equal to 3 years following implementation. |
| | Long term — Impact has a duration greater than 3 years following implementation. |
| Area of Analysis | Within park boundary and surrounding GYA. |

Linear developments (e.g., roads, trails, and pathways) have been shown to affect wildlife through direct habitat loss, disturbance and creation of barriers to movement, habitat avoidance, social disruption, and direct or indirect mortality (Jalkotzy et al. 1997, Forman and Alexander 1998, Trombulak and Frissell 2000, Gucinski et al. 2001, Forman et al. 2003, Gaines et al. 2003, Jacobson 2005). The level of impact depends on the nature of the corridor (e.g., length, width, type of use, use levels, etc.), the habitats it traverses,

species present, and whether the linear development occurs in previously disturbed or relatively pristine areas.

Construction of new linear features or expansion of existing features directly impacts the habitat it displaces, as vegetation removed in the process of construction is no longer available for use by wildlife. Once built, the mere presence of linear features can also influence the local environment and site conditions, and thus habitat conditions. Noise and human activity associated

with the construction phase would cause individual animals to avoid the areas of activity in the short term. Activities (e.g., motorized vehicle traffic, biking, walking or hiking, etc.) associated with the linear corridors can disturb wildlife, causing them to leave the area, alter use patterns, or experience a stress response. These responses carry costs in terms of energy expenditures and possibly lost opportunities (Jalkotzy et al. 1997). Some responses are unique to certain wildlife species and differ depending upon an animal's sensitivity, age, or sex and would change according to season, group size, and habitat security. Behavioral responses would be short in duration (temporary displacement) or long-term, such as abandonment of preferred foraging areas. Animal density would be increased in the remaining habitat, which can impact the ability of individual animals to survive. In general, impacts to wildlife from human disturbance are influenced by characteristics of the disturbance itself and would vary depending upon type of activity, distance away, direction of movement, speed, predictability, frequency, and magnitude.

The ecological impacts of linear developments generally expand beyond the actual physical linear footprint. The width of this zone of influence (ZOI) varies and is influenced by individual species' sensitivity, landscape, topographic features, and the patterns of human use (e.g., type, timing, and frequency). For example, a ZOI for a nesting passerine bird is smaller than the zone for a grizzly bear. Estimated grizzly bear ZOIs from roads have ranged from 328 ft to over 2,952 ft (100 m to over 900 m) (Puchlerz and Servheen 1994), whereas those for songbirds have been reported as 33 ft to 327 ft (10 m to 100 m) (Miller et al. 1998).

For this analysis, to account for differences among species two ZOIs along linear features were identified and used to compare and analyze potential impacts among the alternatives considered. These zones were created by buffering the linear features (both existing and proposed) by either 246 ft (75 m) or 1,312 ft (400 m) (Figure 23). The resulting buffers depict areas where wildlife would be affected by disturbance from use of the road or biking and walking along the pathway. Pathway effects on more sensitive species (e.g., bears, most ungulates, some birds) are represented generally by the larger buffer, while those on less sensitive species (e.g., most birds, small mammals) are represented by the smaller buffer. Multi-use pathways were buffered from an alignment 50 ft (15.1 m) from the roadside, assuming their location would generally be

within this distance. Where pathways diverge more than this, impacts would be greater. Where pathways would need to be immediately adjacent to the road because of topographic constraints or resource concerns they were buffered 10.5 ft (3.2 m) from the road.

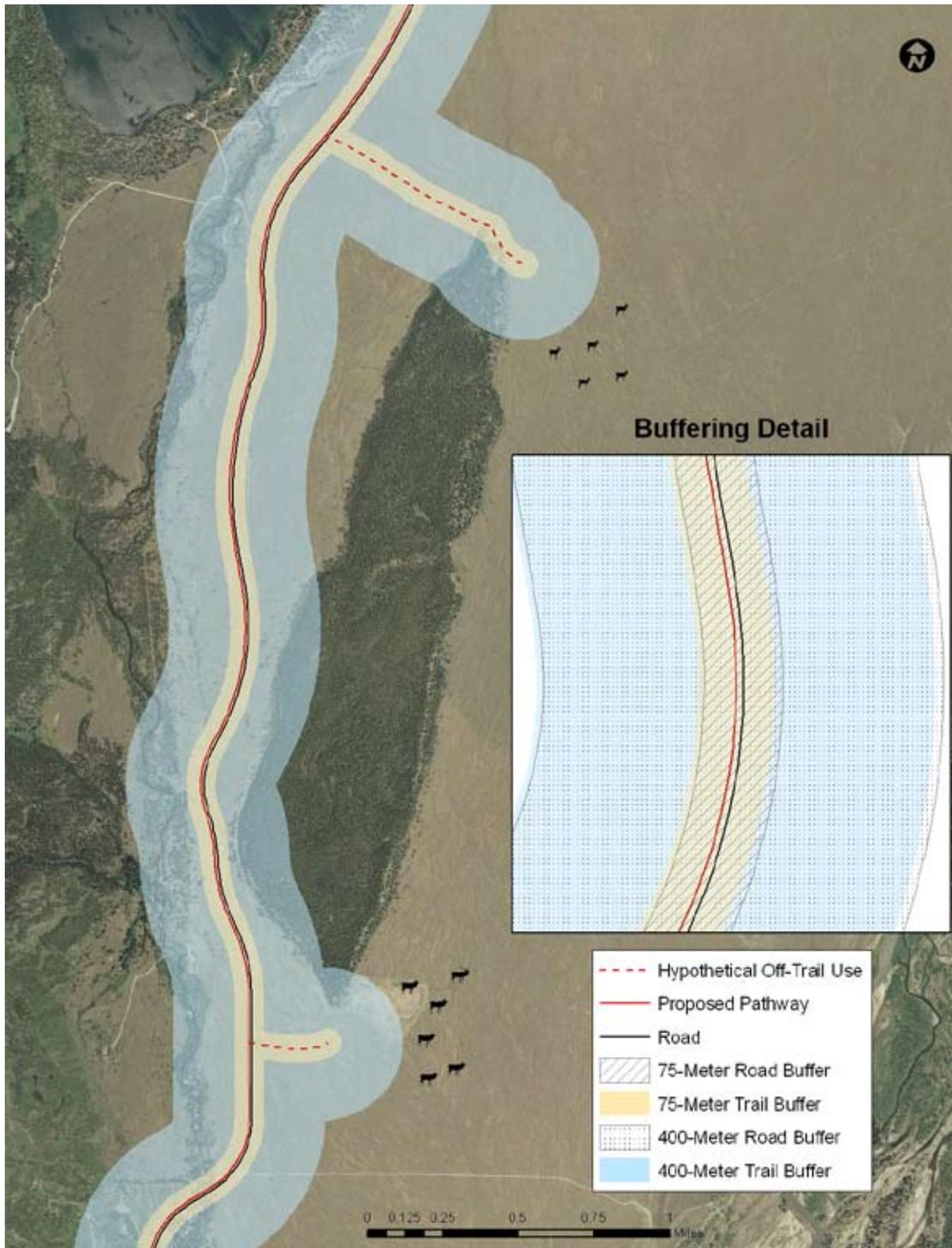
Acreages presented in Appendix B tables were derived from applying these buffers to the landscape and overlaying them on a vegetation and habitat type map.

Predictable and localized activities, such as motorized activities that are confined to specific routes where vehicles seldom stop, would have less impact to wildlife species than activities that are unpredictable and/or widespread. The response of wildlife to a road or pathway would be short term. Increasing levels of use and changes in the type of use, however, would disturb wildlife enough to cause them to move away permanently. Predictability can be a factor in how much disturbance a trail user causes.

For example, some wildlife would become habituated to high-use roads where vehicles seldom stop or stop mostly in predictable locations (e.g., pullouts). In these situations, wildlife would utilize habitat closer to the road than they would otherwise. Generally, the level of predictability along a linear corridor declines as human activities change from (1) vehicles passing through a linear corridor; to (2) vehicles stopping only at established pullouts along the corridor; to (3) vehicles stopping randomly along the corridor; to (4) people exiting vehicles at random points along the corridor; to (5) people approaching wildlife from random points along a corridor. Because pathways would allow users to easily stop and approach wildlife at any point along the corridor (Figure 21), the ability of wildlife to predict human responses would be low. This potential off trail use is likely to increase the average ZOI for the corridor (Figure 23).



FIGURE 23
AN EXAMPLE OF THE APPLICATION OF 75- AND 400-METER BUFFERS APPLIED TO REPRESENT A PATHWAY'S ZONE OF INFLUENCE ON ADJACENT HABITATS, AND HOW UNPREDICTABLE OFF-TRAIL USE CAN EXTEND THIS INFLUENCE



General Measures of Habitat Loss for All Alternatives

Direct habitat loss from construction of improved shoulders, multi-use pathways, and road realignments among eight vegetation classes ranges from 0 acres for Alternative 1 to 85.1 acres (34.4 ha) for Alternative 4 (Tables 19 and 22). Indirect habitat loss from the 75- and 400-m ZOI associated with roads in the project area is presented in Table 23. These tables present the net habitat loss associated with linear feature ZOIs and range from 0 acres for Alternative 1 to 215.9 acres (87.4 ha) for Alternative 4 (Table 23). Appendix B includes a more detailed depiction of direct habitat loss for each alternative. These tables will be referred to as needed in the context of subsequent topical impact sections.

Grand Teton National Park is a large, natural area that supports robust populations of several large, potentially dangerous species of mammals. Existing forms of park transportation (i.e., vehicles, bicyclists, and pedestrians on several classes of roads, pedestrians on and off trails, equestrians, and both motorized and non-motorized watercraft) each have certain wildlife hazards that are reasonably well understood. Generally, vehicles are subject to potentially dangerous collisions with wildlife, while non-motorized users are concerned with undesirably close encounters with potentially dangerous wildlife.

Providing multi-use pathways in this context presents new human safety challenges for park managers and the public. Wildlife hazards associated with pathways would be similar to those associated with trails, with one important exception: bicycles and other wheeled vehicles, which are not permitted on trails but would be permitted on pathways, would be able to move quickly and quietly through the landscape. This would greatly increase the probability of sudden, surprise encounters with and aggressive responses from wildlife. These encounters take place due to the absence of two important mitigating factors: the slow speed of pedestrians and loud noise of motorized vehicles. Areas near noisy streams or where sight distances are minimized by terrain, daylight, or vegetation would have increased hazards, as would using any portion of a pathway after dark.

Encounters with bears (especially grizzly bears), moose, and bison are of particular concern because of their propensity to respond with aggression that can result in serious human injuries or death. Higher frequencies of encounters can be expected in higher quality habitats for each of the species concerned. Pathway alignments that stay as close to the road as possible, maximize sight distances, and avoid high quality habitat can help mitigate, but not eliminate, these hazards (Herrero et al. 1986). Signage and other forms of education would also mitigate risk. Not surprisingly, few data exist from which to base predictions of encounter rates because precedents for combining pathways with large protected areas and high densities of large, dangerous mammals are rare.

Bears

Some information on bicyclist encounters with grizzly bears is available from Herrero and Herrero (2000), from which the following information was taken. In North America, 33 records were found for bicyclist encounters with grizzly bears in which the bear responded aggressively. Five of these occurred on roads used by cars and the remaining occurred on trails or nearby. In most cases, grizzly bears charged or chased bicyclists. In 12 percent (4 of 33) of encounters, bicyclists were injured by grizzly bears; in 75 percent of these cases (3 of 4), injuries were serious (requiring more than 24 hours in a hospital). The majority (22 of 33) of encounters occurred in Banff and Jasper National parks, where mountain biking is allowed on some trails. Ninety-five percent of encounters in which distance was estimated, the bicyclist first became aware of the bear at less than 163.8 ft (50 m), which Herrero (1985) defined as a “sudden encounter.” Importantly, while not conclusive, the data suggest that rates of sudden encounters with bears are much higher among bicyclists than pedestrians. Indeed, in Canada’s Kluane National Park (Kluane National Park 1997), park managers state that “Mountain bikers travel quickly and quietly on the trails. As a result, they are much more likely to have surprise encounters with bears and other wildlife than with hikers and horses.” Most of the encounters documented by Herrero and Herrero (2000) and discussed above occurred on dirt trails where bicycles would be expected to travel more slowly and make more noise than they would on a paved pathway.



**TABLE 22
SUMMARY OF DIRECT HABITAT LOSS¹ (ACRES) FROM LINEAR ROAD
FEATURES AND MULTI-USE PATHWAYS BY ALTERNATIVE**

| Road Segment | Road Features ² | | | | | Separated Pathways | | | | |
|--|----------------------------|--------------|--------------|--------------|-------------|--------------------|-------------|--------------|--------------|--------------|
| | Alternative | | | | | Alternative | | | | |
| | 1 | 2 | 3 | 3a | 4 | 1 | 2 | 3 | 3a | 4 |
| Granite Canyon Entrance Station to Moose | 0.00 | 0.00 | 3.96 | 12.07 | 3.96 | 0.00 | 0.00 | 6.14 | 0.00 | 13.92 |
| South entrance to Antelope Flats | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 17.81 | 17.81 | 17.81 |
| Gros Ventre Junction to West Boundary | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.84 | 0.00 |
| Moose to Signal Mountain | 0.00 | 13.28 | 7.69 | 3.85 | 0.00 | 0.00 | 0.00 | 20.90 | 28.12 | 34.55 |
| North Jenny Lake Junction to String Lake | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.86 | 0.00 |
| Signal Mountain to Jackson Lake Junction | 0.00 | 0.00 | 3.30 | 2.17 | 2.07 | 0.00 | 0.00 | 0.00 | 2.20 | 2.20 |
| Jackson Lake Junction to Colter Bay | 0.00 | 0.00 | 3.98 | 5.37 | 0.00 | 0.00 | 0.00 | 0.00 | 6.59 | 10.60 |
| TOTAL FOR ALL ROAD SEGMENTS³ | 0.00 | 13.28 | 18.93 | 23.46 | 6.03 | 0.00 | 0.00 | 44.85 | 59.42 | 79.08 |

¹Figures represent net difference from existing condition.

²Road features include a combination of asphalt, gravel, signs, etc associated with a widened road shoulder.

³Total acres lost for
 Alternative 1 0.00
 Alternative 2 13.28
 Alternative 3 63.78
 Alternative 3a 82.88
 Alternative 4 85.11

Bison

Many records are available for human-bison encounters in which aggressive reactions by bison occurred. In Grand Teton, bison have charged several people; however, only one human injury has been documented to date. In this case, a man was seriously gored in the thigh after approaching a bison bull too closely.

In YNP, however, bison have charged and made contact with humans at least 81 times from 1978-1999 (Yellowstone. net 2000). Many victims received serious injuries, and two visitors died from their injuries. In each case, bison appeared to be reacting defensively to people who approached them too closely. By comparison, grizzly bears injured 30 people and killed two humans during the same period, making bison the most dangerous animal in YNP.

Moose

Moose have a long-standing but perhaps downplayed reputation of aggressive encounters with humans. Stories of anglers being treed by moose are common, as are chases by moose cows protecting calves. In rare cases, moose have killed humans (C. Schwartz 2005, pers. comm.). Moose cows protecting calves are perhaps the most dangerous, and approaching too closely or having sudden, surprise encounters seems to be a common denominator in aggressive responses. In Grand Teton, several such encounters have been reported to date. One, in 2006, involved a boy that was kicked in the head by an adult female moose after he approached the cow and her two calves too closely. The boy received a serious head injury.

**TABLE 23
AREA (ACRES) WITHIN 75-METER AND 400-METER ZONE OF INFLUENCE BUFFERS
BY ALTERNATIVE AND SECTION¹**

| Road Segment | 75-m ZOI | | | | | 400-m ZOI | | | | |
|--|-------------|--------------|---------------|---------------|---------------|-------------|--------------|---------------|---------------|---------------|
| | Alternative | | | | | Alternative | | | | |
| | 1 | 2 | 3 | 3a | 4 | 1 | 2 | 3 | 3a | 4 |
| Granite Canyon Entrance Station to Moose | 0.00 | 0.00 | 19.70 | 6.88 | 44.24 | 0.00 | 0.00 | 20.33 | 6.38 | 34.24 |
| South entrance to Antelope Flats | 0.00 | 0.00 | 47.12 | 47.12 | 47.12 | 0.00 | 0.00 | 48.56 | 48.56 | 48.56 |
| Gros Ventre Junction to West Boundary | 0.00 | 0.00 | 0.00 | 4.65 | 0.00 | 0.00 | 0.00 | 0.00 | 2.67 | 0.00 |
| Moose to Signal Mountain | 0.00 | 13.38 | 64.87 | 81.80 | 96.68 | 0.00 | 72.52 | 63.44 | 76.63 | 94.71 |
| North Jenny Lake Junction to String Lake | 0.00 | 0.00 | 0.00 | 7.47 | 0.00 | 0.00 | 0.00 | 0.00 | 3.69 | 0.00 |
| Signal Mountain to Jackson Lake Junction | 0.00 | 0.00 | 3.32 | 8.55 | 8.54 | 0.00 | 0.00 | 3.28 | 8.26 | 8.27 |
| Jackson Lake Junction to Colter Bay | 0.00 | 0.00 | 4.06 | 24.41 | 29.92 | 0.00 | 0.00 | 4.36 | 25.30 | 30.14 |
| TOTAL FOR ALL ROAD SEGMENTS | 0.00 | 13.38 | 139.07 | 180.88 | 226.50 | 0.00 | 72.52 | 139.97 | 171.49 | 215.92 |

¹Values represent the net difference between the existing condition and impacts associated with each alternative.

Cougars

From 1991-2003, seventy-one cougar attacks resulting in 10 human deaths were recorded in North America (Beier 2005); however, none were reported from Wyoming. Details of these accounts indicate that children are more vulnerable than adults, and at least four attacks involved bicyclists, including one mountain biker fatality in California. Cougar attacks are too rare to make valid comparisons among user groups, but most victims shared the common trait of recreating in cougar habitat when attacks occurred. While risk of cougar attacks would increase if pathways attract more visitors into cougar habitat, no evidence could be found to suggest that user attributes associated with pathways would increase risk above that experienced by other outdoor recreationists.

Effects of Alternative 1 — No Action

Endangered and Threatened Species
(Federally Listed Species)

Bald Eagle

Under Alternative 1, the presence and ongoing maintenance of existing park roads would not directly affect bald eagles or their habitat. Road maintenance activities would not occur within one-half mile (0.8 km) of bald eagle nests, and no eagle habitat would be removed during routine road maintenance.

Indirect effects from road use and maintenance or from the new road management strategies on the Moose-Wilson Road would include a reduction in habitat effectiveness within a ZOI from the road. Based on nesting habitat management guidelines (Greater Yellowstone Bald Eagle Working Group 1996), it was assumed that bald eagles would avoid suitable habitat within a 1,312-ft (400-m) buffer from the road. The amount of habitat within this ZOI that would be impacted by Alternative 1 would be the same as



the amount impacted under existing conditions (Table 23). Disturbance from human presence, noise, and recreation within the ZOI could displace eagles or occasionally flush birds from perches in areas that contain suitable eagle habitat, such as near Moose Bridge, Cottonwood Creek, and at Jackson Lake Dam. Other indirect effects from human disturbance would include modifications of behavior, habitat avoidance, and possibly changes in reproductive success. Activities associated with road maintenance or vehicle use of the road would be short term and would not be expected to cause measurable changes in bald eagle use of the area. Overall, impacts to local and regional bald eagle populations under Alternative 1 are expected to be long-term, localized, none to minor, and adverse.

Cumulative Impacts

Activities occurring within bald eagle habitat that would adversely affect bald eagles are limited and, for public land management actions, are analyzed both individually and cumulatively via the NEPA compliance process. Other activities and issues likely to affect bald eagle populations include private land development, vegetation management, human recreation, contaminants, and illegal killing of individuals.

Residential development on private lands adjacent to the Snake River outside of Grand Teton National Park has increased dramatically, and this trend is expected to continue into the foreseeable future. However, the number of bald eagles nesting and producing young within the Snake Population Unit, including Grand Teton National Park, has increased. The development thresholds at which eagle productivity within the Snake Population Unit would decline are unknown; but they are not expected to occur as a result of Alternative 1 or other projects proposed at this time. Planned development and improvements within the Park include construction of a new visitor center at Moose, replacement of the Moose Entrance Station, construction of a new visitor facility at the LSR Preserve, upgrades to the Jenny Lake Lodge visitor accommodations and employee housing facilities, replacement of the Snake River Bridge near Flagg Ranch, the chip-and-seal project from Moran to Jackson Lake Lodge, and reconstruction and widening of North Park Road between Lizard Creek Campground and the South Entrance of Yellowstone. The latter project will widen the roadway from its current approximately 25-ft (7.6-m) width to 32 ft (9.8 m). All of these projects are likely to cause bald eagles to avoid the project areas during construction due to an increase in noise and human activity; however, avoidance of the area is anticipated to

be temporary, and none of the projects is known to occur within one-half-mile (0.8 km) of an active bald eagle nest.

Recreational activities, such as floating, fishing, hiking, horseback riding, snowshoeing, and skiing, within bald eagle nesting and foraging areas could adversely impact nest occupancy and productivity if these activities occur in proximity to active nests. However, the Park has been successful at minimizing human intrusion into the one-half mile (0.8-km) spatial buffer around active bald eagle nests during the nesting season, thus minimizing disturbance to nesting eagles. There is no evidence that suggests that current levels of recreational use within Grand Teton National Park or elsewhere in Jackson Hole have adversely affected bald eagle nesting. It is likely, however, that human recreational use of the Snake River would at times conflict with bald eagle foraging and cause displacement of individual birds from certain foraging areas when humans are present. In places of heavy recreational use, such as in the Snake River Canyon south of the Park, bald eagles appear to adapt to human presence and human-related disturbances by spatially and/or temporally adjusting their foraging activities and apparently do so without adversely affecting reproductive success. Bald eagles that are not habituated to human-related disturbances would abandon nests and/or alter their behavior resulting in nest failure and low productivity (MBAMP 1994).

An “Incidental Take” permit for 18 bald eagles was given to the Canyon Club golf course development project within the Snake River Canyon in southern Jackson Hole in 2002, but this potential “Take” was determined by the USFWS not to jeopardize the continued existence of the species. After 2 years of golf course construction, no “Incidental Take” of eagles has occurred because of construction-related activities on the Canyon Club project.

These activities cumulatively contribute to increased mortality risks to bald eagles and reduce the availability of secure eagle habitat. However, the total cumulative impact of the above listed activities, as well as other unidentified actions occurring within bald eagle habitat, does not appear to have adversely affected population recovery, as evidenced by current population numbers in the GYA. In the long term, actions under Alternative 1 are not expected to increase human presence within or improve access to bald eagle habitat that would cumulatively reduce habitat security.

Overall, long-term, localized, adverse cumulative impacts to the bald eagle would be minor. Adverse impacts resulting from Alternative 1 would be expected to contribute slightly to cumulative impacts affecting bald eagles.

Effects Determination and Summary of Rationale

Under Alternative 1, individual bald eagles would be displaced by human presence, noise, and activities associated with road maintenance and vehicular use of roads. Given that the project area is outside of bald eagle nest territories, however, these effects are expected to be negligible. No actions included in this alternative would affect important bald eagle wintering or foraging habitats. Overall, impacts to local and regional bald eagle populations under Alternative 1 are expected to be long-term, localized, none to minor, and adverse. Therefore, this alternative “may affect, but is not likely to adversely affect” bald eagles.

Canada Lynx

Under Alternative 1, the existing transportation infrastructure would remain in use and routine maintenance of existing roadways would continue to occur. New road management strategies would be tested on the Moose-Wilson Road. The presence and ongoing maintenance of existing park roads that are within or adjacent to lynx habitat could have minor adverse effects on lynx. Direct effects to lynx could include permanent loss of a small amount of habitat (likely less than 5.0 acres [2.0 ha]) caused by paving of roads and pullouts in forested habitats or secondary habitats important for connectivity. Potential lynx habitat occurs adjacent to the Moose-Wilson Road, along the Teton Park Road between Signal Mountain and Jackson Lake Dam, and along North Park Road between Jackson Lake Junction and Colter Bay. In the Wyoming range of northwestern Wyoming, lynx were documented using non-forested habitats where they were intermingled with or immediately adjacent to primary habitat (Squires and Laurion 2000, Ruediger et al. 2000). Thus, the sagebrush habitats adjacent to the Teton Park Road would provide lynx travel habitat that links habitats and populations both within the Park and between more southern and northern areas of the GYA. These habitats are part of an identified linkage area connecting the Granite LAU with the Berry and Two Ocean LAUs.

Direct mortality could also result from collisions with vehicles. There are few records of lynx fatalities resulting from collisions with vehicles, but they have been documented (Ruediger et al. 2000). No lynx have been reported killed by vehicles in the Park. The risk of mortality relates to the type of roadway, traffic volume, and lynx density. The risk of roadway mortality and the degree of habitat fragmentation increases as highways are upgraded and/or speeds are increased (Ruediger et al. 2000). No

roadway upgrades or changes to speed limits are proposed; therefore, the risk of roadway mortality and effects on lynx are anticipated to be long-term, localized, none to minor, and adverse.

Indirect effects from road use and maintenance, or from the new road management strategies on the Moose-Wilson Road, would include a reduction in habitat effectiveness within a ZOI beyond the boundaries of the habitat actually lost to the road. Other indirect effects to lynx would include human-caused displacement of animals from areas adjacent to roads or other behavior modifications. There is little information on the disturbance effects of linear corridors on medium-sized mammals, such as lynx. They would be less tolerant of human activities in the southern part of their range where suitable habitats are naturally more fragmented (Jalkotzy et al. 1997). However, some anecdotal information suggests that lynx may be relatively tolerant of humans (Ruediger et al. 2000), with the exception of human activity near den sites (Ruggiero et al. 2000). It is not known if lynx avoid habitats adjacent to linear features or if human activities along these corridors displace them; thresholds at which this may occur are also unknown (Ruediger et al. 2000). For the purposes of this analysis, it was assumed that lynx would avoid coniferous habitats within 1,312 ft (400 m) of linear features (400-m ZOI). Approximately 2,825 acres (1,143 ha) of coniferous forest habitat occurs within the 1,312-ft (400-m) ZOI of the existing transportation system. No lynx den sites are known in the Park, but given that they generally are located in mature subalpine forests with abundant coarse woody debris (Squires and Laurion 2000), it is unlikely that any den sites are close to the main transportation system. Therefore, effects on lynx are anticipated to be long-term, localized, none to minor, and adverse. The threshold where human activity precludes use of an area by lynx is unknown (Ruediger et al. 2000).

Cumulative Impacts

Other activities occurring in the GYA that would affect lynx or their habitat include timber management, wildland fire management (including prescribed burns both inside and outside the Park), grazing (outside and within the Park), winter recreation (including grooming for Over-Snow Vehicles [OSVs]) and trapping of other furbearers. With the exception of trapping, all of these activities have the potential to affect forest successional stages, and consequently, snowshoe hare and lynx. Continued use and maintenance of the existing park roadways within the project area are expected to add minor cumulative impacts to lynx.



Impact Determination and Summary of Rationale

Under Alternative 1, individual lynx would be displaced by human presence and noise associated with routine maintenance and continued use of the transportation system, but given that most of the project area is outside of mapped lynx habitat, these effects are expected to be long term, localized, and minor, and adverse. No actions are proposed in this alternative that would affect important lynx linkage areas. The likelihood of a lynx being struck and killed by a vehicle is anticipated to be low. Lynx likely occur in the Park at low densities, if at all, and no vehicle mortalities have been reported to date. Based on the above assumptions and conclusions, Alternative 1 “may affect, but is not likely to adversely affect” Canada lynx.

Grizzly Bear

Under Alternative 1, the presence, use, and ongoing maintenance of existing park roads within or adjacent to bear habitat (Table 24) would adversely affect grizzly bears, both directly and indirectly. Direct effects include permanent loss of habitat caused by paving of roads and pullouts and the potential for vehicle-caused mortality. Indirect effects from use and maintenance of existing primary roads would include a reduction in habitat effectiveness within the 1,312-ft (400-m) ZOI of existing roads, which is estimated to be 1,819 acres (736 ha) within the designated grizzly recovery zone and 22,220 acres (8,992 ha) (Appendix B, Table B-3) within the remainder of the Park. The section of the Park road between North Jenny Lake Junction and Jackson Lake Junction – which is outside the recovery zone but occupied by grizzly bears – accounts for 3,227 acres (1,306 ha) of the affected area outside the recovery zone. A reduction in habitat effectiveness could potentially result in slightly lower reproductive fitness of some individual bears within home ranges adjacent to the road corridor. However, range and population increases of grizzly bears in Grand

Teton National Park suggest that impacts associated with roads have not yet reached a threshold impact level that jeopardizes the survival of grizzly bears in the Park (Figure 24). Other indirect effects to grizzly bears include human-caused displacement of bears from areas adjacent to roads, habituation to humans, and other potential behavior modifications. Most of these impacts would be considered long-term, localized, minor, and adverse; however, impacts from vehicle mortality could be considered moderate because they could affect one or more bears but would not threaten the survival of the species. Sixteen grizzly bears have been road-killed within the GYA since 1977 (M. Haroldson 2006, pers. comm.), including one with Grand Teton National Park.

Cumulative Impacts

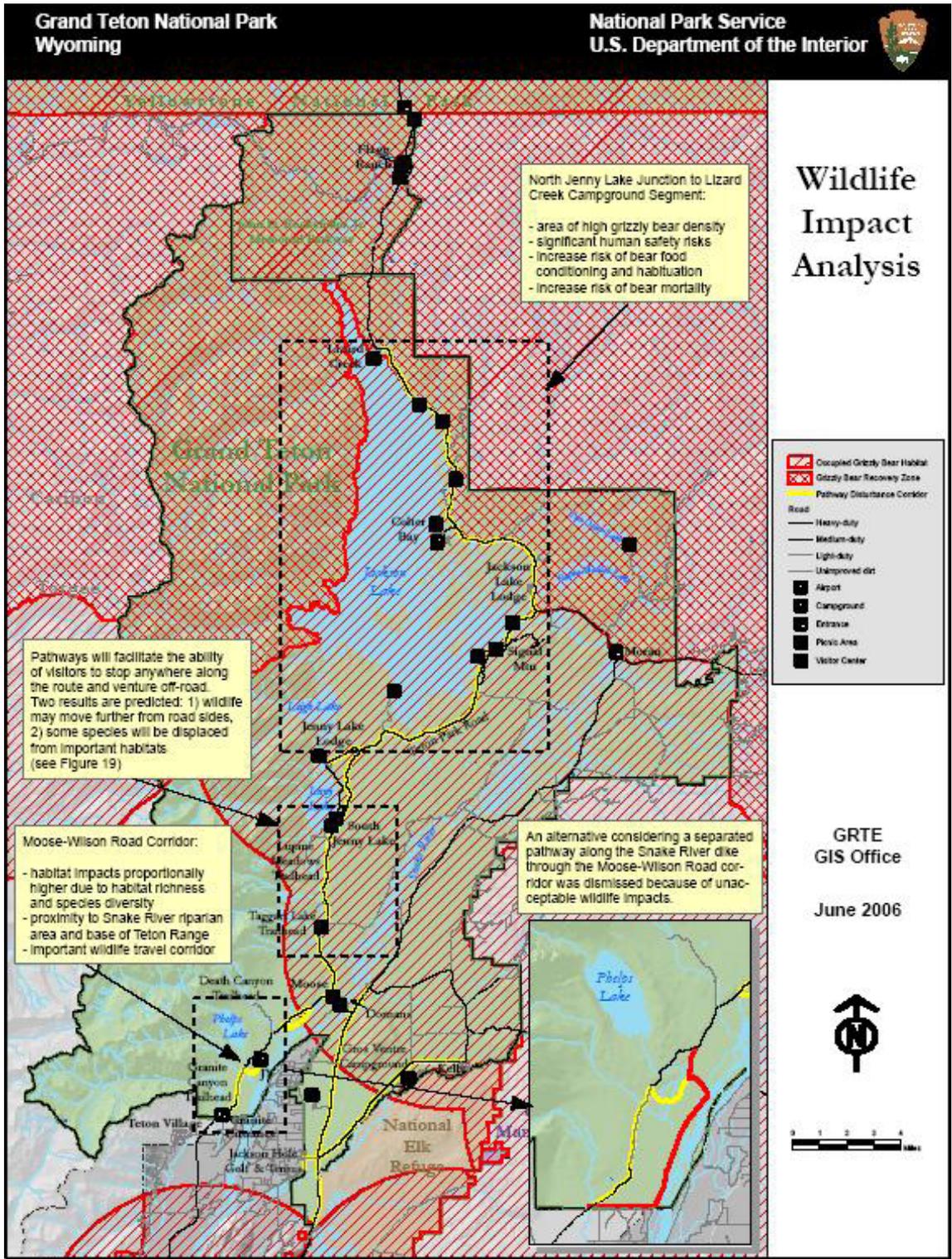
Actions occurring on public lands within the recovery zone that would adversely affect grizzly bears or their habitat, such as oil and gas exploration and development, logging, and mining, are limited by the ESA (USFWS 1982) and are analyzed both individually and cumulatively via the NEPA compliance process. Other activities and issues likely to affect grizzly bears in the recovery zone include:

- Livestock grazing (which would impact grizzly bears through management actions).
- Private land development.
- Firewood cutting.
- Road use/management.
- Timber harvest (past).
- Recreation activities that lead to human-bear conflicts (especially big game hunting).
- Vegetation management.
- Wildland and prescribed fire.

TABLE 24
MILES OF ROAD IN GRAND TETON NATIONAL PARK BY ROAD CLASS INSIDE|
AND OUTSIDE OF THE GRIZZLY BEAR RECOVERY ZONE
(PRIMARY CONSERVATION AREA), 2004

| Road Class | Inside Recovery Zone | Outside Recovery Zone |
|-------------------|-----------------------------|------------------------------|
| Heavy Duty | 13.98 | 26.86 |
| Medium Duty | 1.25 | 52.83 |
| Light Duty | 38.4 | 121.04 |
| Unimproved Dirt | 16.08 | 79.59 |

FIGURE 24
GRIZZLY BEAR OCCUPIED HABITAT (FROM SCHWARTZ ET AL. 2002) AND RECOVERY ZONES
IN GRAND TETON NATIONAL PARK



- Loss or decline of important food sources (e.g., whitebark pine seeds due to fire suppression).
- Potential reduction in elk and bison populations.

These activities would cumulatively contribute to increased mortality risks, reduce availability of secure habitat, and diminish habitat effectiveness for grizzly bears. The total cumulative impact of the above-listed activities, as well as other unidentified actions occurring within the grizzly bear recovery zone, does not appear to be adversely affecting population recovery, as evidenced by the expanding grizzly bear population in the GYA (Eberhardt and Knight 1996; Schwartz et al. 2002; Pyare et al. 2004).

Cumulative impacts to grizzly bears in the GYA specific to this Final Plan/EIS include road kills, recreation use, management removals, and road or project construction. Eighteen grizzly bears have been road-killed within the GYA since 1977 (M. Haroldson 2006, pers. comm.), including two within Grand Teton National Park. The cumulative impacts of these actual losses and possible future road kills are likely to be minor because road kills are not a significant source of mortality to the GYA population.

Increases in backcountry recreation by humans in and around Grand Teton National Park would negatively affect grizzly bears if human-bear encounters increase. Elk hunting, as part of the Park's annual elk reduction, occurs on approximately 66,600 acres (26,952 ha) of the Park's backcountry, 29,100 acres (11,776.4 ha) of which is in the recovery zone. Hunting of elk and other big game also occurs outside of and adjacent to the Park's boundaries. Conflicts between grizzly bears and hunters appear to be increasing (Gunther et al. 2004) and these encounters are a potential source of bear mortality. In 2004, seven of 19 (37 percent) human-caused grizzly bear mortalities in the Yellowstone ecosystem were attributed to hunter conflicts (M. Haroldson 2005, pers. comm.), and for the first time in many years, female grizzly recovery mortality limits were exceeded. In 2005 mortalities attributed to hunters dropped to 4 of 14 (29%). However, unless hunter-related conflicts increase substantially, the cumulative adverse effects of these conflicts at current grizzly bear population levels are likely to be minor. Land and wildlife management agencies, including Grand Teton National Park, have active programs designed to educate backcountry users about grizzly bears and the requirements designed to reduce human-bear conflicts.

Several privately owned and State of Wyoming-owned in-holdings are present in Grand Teton National Park;

depending upon future human activities occurring on these properties, grizzly bears would be negatively affected. For many years, Grand Teton National Park has attempted to secure these in-holdings with lifetime leases and out-right purchases and has been quite successful in doing so. No large-scale developments or land-based projects have been proposed for these in-holdings. The LSR Preserve (approximately 1,100 acres [445 ha] in southern Grand Teton National Park) will be conveyed to the federal government in 2006 to be administered as part of the Park. Although most of the development that has been present on the ranch will be removed, the current owners will develop an interpretive facility and trail system prior to the conveyance. Recently, the federal government has made efforts to secure several parcels of state-owned land within Grand Teton National Park. The cumulative adverse effects of possible future development occurring on these in-holdings are likely to be minor.

The recent Teton County, Wyoming approval of the Snake River Associates development plan for Teton Village on private land adjacent to the Park's south boundary could have additional cumulative, long term impacts on grizzly bears. This development will likely result in higher numbers of visitors to the Park and greater associated dispersed use. This may be particularly true in the southwest corner of the Park, where excellent bear habitat exists. Grizzly bears will likely colonize this area, even though it is several miles outside of the primary conservation area (PCA).

In the past 20 years, two grizzly bears have been removed from Grand Teton National Park for management reasons: one for cattle depredation and one because of human habituation and food conditioning. The latter bear came to Grand Teton National Park as a nuisance bear after being relocated from the northern to the southern part of the ecosystem. An additional bear that had broken into a cabin at the AMK Ranch in Grand Teton National Park was killed after being relocated from Grand Teton National Park to Montana and continuing its nuisance behavior there. Management removals within the PCA and a 10-mile (16.1-km) buffer around it are counted against recovery parameters (USFWS 2003), mortality limits in the Conservation Strategy (USFWS 2003), and likely those associated with the delisting proposal (Interagency Grizzly Bear Study Team 2005). The existing transportation system increases the potential for management removals because of the access to grizzly bear habitat it provides, adding cumulatively to removals throughout the ecosystem.

Overall, the contribution of this alternative to long-term cumulative impacts to grizzly bears in the GYA would be minor.

Mitigation Measures

- “Bearwise” education would be conducted with all personnel involved in road and reconstruction and maintenance projects.
- All food and other attractants would be properly stored at all times, and all food materials, garbage, and other attractants would be packed out on a daily basis if they cannot be stored in bear-resistant containers.
- Project crews (other than law enforcement personnel) would not carry firearms.
- Project crews would carry bear pepper spray when conducting project activities and would be trained in bear safety.
- All project crews working in grizzly bear habitat would meet standards for sanitation, attractant storage, and access.
- All grizzly bear/human confrontations would be reported to Science and Resource Management personnel.

Effects Determination and Summary of Rationale

Alternative 1 is not expected to have substantial adverse population level impacts on grizzly bears nor would it jeopardize the recovery of grizzly bears within the GYA. However, it is reasonable to expect that one or more grizzly bears could be struck and killed by vehicles using park roads during the lifetime of this Plan. Therefore, impacts to the Park and Greater Yellowstone grizzly bear populations under Alternative 1 would be long-term, localized, and moderate because one or more individual bears are “likely to be adversely affected” by this alternative.

Gray Wolf

Under Alternative 1, the presence, use, and ongoing maintenance of existing park roads within or adjacent to wolf habitat would continue to adversely affect wolves, both directly and indirectly. Direct effects include permanent loss of habitat caused by paving of roads and pullouts and the potential for vehicle-caused mortality. Radio-telemetry data have shown that the Teton and Sage packs regularly cross U.S. Highway 89/191 between Moran and Moose and between Moran and the Park’s east boundary. Other wolves from unknown pack affiliations have also been observed crossing park roads on many

occasions (S. Cain 2006, pers. comm.). Indirect effects from road use and maintenance would include a reduction in habitat effectiveness within a ZOI beyond the boundaries of the habitat actually paved by the road. The loss of habitat associated with existing primary roads in the Park is estimated to be 14,577 acres (5,899 ha) (Appendix B, Table-B-3), using a buffer of 1,312 ft (400 m) on each side of the road as an average ZOI. Other indirect effects to wolves include human-caused displacement of wolves from areas adjacent to roads and possibly other behavior modifications. Under this alternative, no activities would occur within 1 mile (1.6 km) of known wolf dens or rendezvous sites.

Most of these impacts would be considered long term, localized, minor, and adverse; however, impacts from vehicle mortality could be considered moderate because they could affect one or more wolves but would not threaten the survival of the species. Between 1995 and 2001, thirteen wolves were killed by vehicles in the GYA, and 3 wolves were killed within the Park during the last two years. Existing road conditions and future road reconstruction could result in the death of additional wolves.

Cumulative Impacts

Activities occurring within wolf habitat that would adversely affect wolves in the GYA are limited and, for public land management agencies are analyzed both individually and cumulatively via the NEPA compliance process. Other activities and issues likely to affect wolves occurring within the recovery zone include livestock grazing, private land development, vegetation management, potential reduction in elk and bison populations, and control actions.

These activities would cumulatively contribute to increased mortality risks and reduce the availability of secure habitat. However, the total cumulative impact of the above-listed activities, as well as other unidentified actions occurring within wolf habitat, does not appear to have adversely affected population recovery, as evidenced by the quick expansion of the wolf population following reintroduction and the continued expansion into areas outside of YNP. In the long term, this alternative is not expected to increase human presence within or improve access to wolf habitat that would cumulatively reduce habitat security.

Cumulative impacts to the gray wolf specific to this Final Plan/EIS also include road kills, recreational use, and road reconstruction in the area. Between 1995 and 2001, 13 wolves were killed by vehicles in the GYA. Existing road



conditions and future road reconstruction would result in the death of additional wolves. However, the cumulative impacts of these actual losses and possible future road kills on the Greater Yellowstone population are likely to be minor.

Several privately owned and State of Wyoming-owned in-holdings are present in Grand Teton National Park. Depending upon future human activities occurring on these properties, wolves would be negatively affected. For many years, Grand Teton National Park has attempted to secure these in-holdings with lifetime leases and out-right purchases and has been quite successful in doing so. No large-scale developments or land-based projects have been proposed for these in-holdings. The LSR Preserve (approximately 1,100 acres [445 ha] in southern Grand Teton National Park) will be conveyed to the federal government in 2006 to be administered as part of the Park. Although most of the development that has been present on the ranch will be removed, the current owners will develop an interpretive facility and trail system prior to the conveyance. Recently, the federal government has made efforts to secure several parcels of state-owned land within Grand Teton National Park. The cumulative impacts of existing residential activities and possible future development occurring on these in-holdings are likely to be minor.

Overall, long-term adverse cumulative impacts to the gray wolf would be minor. Adverse impacts to gray wolves resulting from Alternative 1 would be expected to contribute only slightly to cumulative impacts to wolves.

Effects Determination and Summary of Rationale

Alternative 1 is not expected to have substantial adverse population level impacts on wolves nor would it jeopardize the recovery of wolves within the GYA. However, it is reasonable to expect that one or more wolves could be struck and killed by vehicles using park roads during the lifetime of this Plan. Therefore, impacts to the Park and Greater Yellowstone wolf population under Alternative 1 would be long-term, localized, and moderate because one or more individual wolves are “likely to be adversely affected” by this alternative.

Yellow-billed Cuckoo

Under Alternative 1, the presence, use, and ongoing maintenance of existing park roads would not directly affect the yellow-billed cuckoo or its habitat. No known cuckoo nests are within or adjacent to the project area, and no potential nesting habitat would be removed during road maintenance.

Indirect effects from road use and maintenance or from the new road management strategies on the Moose-Wilson Road would include a reduction in habitat effectiveness within a ZOI from the road. Based on findings reported in Miller et al. (1998) for other passerine species, it was assumed that cuckoos would avoid suitable habitat within a 246-ft (75-m) buffer from the road. The amount of habitat within this ZOI that would be impacted by Alternative 1 would be the same as the amount impacted under existing conditions (Table 23). Studies have shown that passerine bird species respond to human disturbance in several ways and that these responses vary depending upon the species, sex, and age of an individual, as well as on the time of year and quality and foraging potential of adjacent habitat (Knight and Temple 1995, Gutzwiller et al. 1998). How cuckoos would respond to and be impacted by noise and human presence from road maintenance are relatively unknown; however, responses would include habitat avoidance, nest abandonment, behavior modifications, or reproductive failure, as observed by other passerine bird species (Boyle and Samson 1985, Knight and Temple 1995, Miller et al. 1998, Gutzwiller et al. 1998, Buhler and Anderson 1999).

Because no cuckoos have been reported in the project area and activities associated with road maintenance would be short term and localized, impacts from Alternative 1 would not be expected to change yellow-billed cuckoo use of the area measurably, and adverse impacts would be none to minor.

Cumulative Impacts

Activities occurring within yellow-billed cuckoo habitat that would adversely affect this species are limited and, for public land management actions are analyzed both individually and cumulatively via the NEPA compliance process. Other activities and issues likely to affect yellow-billed cuckoo populations include private land development, loss of riparian habitat, human recreation, and nest predation.

These activities would cumulatively contribute to increased mortality risks to cuckoos and reduce the availability of secure cuckoo habitat. Overall, long-term adverse cumulative impacts to cuckoos would be minor. Adverse impacts resulting from Alternative 1 would be expected to contribute slightly too cumulative impacts affecting yellow-billed cuckoo.

Effects Determination and Summary of Rationale

Under Alternative 1, human presence, noise, and activities associated with road maintenance would displace

individual cuckoos; however, given that no cuckoos are known to nest in the Park, these effects are expected to be none minor. No actions are proposed in this alternative that would affect potential cuckoo breeding or nesting habitats. Overall, impacts to yellow-billed cuckoo populations under Alternative 1 are expected to be short term, localized, and none to minor. Therefore, this alternative “may affect, but is not likely to adversely affect” yellow-billed cuckoos.

Bird Species of Special Concern
(Not Federally Listed) and Neotropical Migratory Birds

Neotropical Migratory Birds / Bird Species of Special Concern

Activities occurring under Alternative 1 would have the lowest impact of the alternatives considered in this document on bird species of special concern and other neotropical migratory bird species that may breed or use areas within the project area. No vegetation or bird habitat would be removed.

Indirect effects from road use and maintenance would include a reduction in habitat effectiveness within a ZOI from the road. Based on findings reported in Miller et al. (1998) for a variety of songbirds, it was assumed that many bird species of special concern and neotropical migratory birds in the project area would avoid suitable habitat within a 246-ft (75-m) buffer from the road, although for some raptor species this ZOI may be greater (Dubois and Hazelwood 1987). The amount of habitat within this ZOI that would be impacted by Alternative 1 would be the same as the amount impacted under existing conditions (Table 23).

The effects that disturbance would have on birds within the ZOI would be variable and difficult to quantify. Factors such as species, sex, and age of individuals, as well as the time of year, magnitude, and type and duration of human activities, affect response (Knight and Temple 1995, Gutzwiller et al. 1998, Postovit and Postovit 1987). Studies have found that birds may respond to human disturbance by avoiding habitat, abandoning nests, and modifying behavior (Boyle and Samson 1985, Gutzwiller et al. 1994, Knight and Temple 1995, Miller et al. 1998). Disturbance to diurnal raptors has also been shown to disrupt behavior when it deters foraging or flushes birds from foraging perches and roosts (Holmes et al. 1993). In addition, nest predation and parasitism has been shown to increase in areas with greater human disturbance due to greater predator attraction and less nest vigilance (Anglestam

1986, Martin 1988). This in turn, may be responsible for a decline in bird species richness and abundance in human-dominated landscapes (Martin 1988).

Maintenance activities associated with Alternative 1 would be limited in time and space; therefore, disturbance to birds would be short term, localized, negligible, and adverse. No long-term adverse effects are anticipated for bird species of special concern and/or other neotropical migratory birds from Alternative 1.

Cumulative Impacts

Neotropical migratory birds are of particular interest to wildlife managers because they have been experiencing severe population declines throughout their North American range. Habitat fragmentation and loss of winter range are at least two factors believed responsible for these declines. Bird species of special concern would be vulnerable to extirpation at the global or state level due to inherent rarity, loss of habitat, or sensitivity to human-caused mortality or habitat disturbances (Fertig and Beauvais 1999). These factors cumulatively contribute to reduced reproductive success, increased mortality risks, and reduced availability of secure habitat to bird species of special concern.

Residential development in Jackson Hole has been responsible for both habitat loss (or at least habitat alterations and conversion) and increased mortality because of predation by domestic pets (especially cats) and collisions with windows. Future residential development in the valley can be expected to continue this negative trend. Within the Park, projects that could affect bird species of special concern and migratory birds and their habitat include construction of a new visitor center at Moose, replacement of the Moose Entrance Station, construction of the LSR Preserve, upgrades to the Jenny Lake Lodge visitor accommodations and employee housing facilities, reconstruction and widening of North Park Road between Lizard Creek Campground and the South Entrance of Yellowstone, replacement of the Snake River Bridge near Flagg Ranch, and the chip-and-seal project from Moran to Jackson Lake Lodge.

In the long term, Alternative 1 is not expected to increase loss of habitat to birds or human presence within important breeding bird habitat that would cumulatively reduce habitat security. Therefore, Alternative 1 would have short term, localized, negligible, adverse impacts to bird species of special concern.



Greater Sage-Grouse

Under Alternative 1, the routine maintenance of existing park roads would not directly affect sage-grouse and their habitat. No leks are located within the project area. Although known nesting, brood-rearing, and wintering habitat are adjacent to roadways in the southern portion of the project area, no vegetation in these habitats would be removed under Alternative 1. Direct mortality of grouse could result from collisions with vehicles. Grouse have been killed by vehicles along the Outer Highway and the Teton Park Road (S. Wolff 2004, pers. comm.). Road use and maintenance under Alternative 1 would not be expected to increase mortality to grouse along roadways or measurably change sage-grouse use of the area.

Indirect effects from road use and maintenance would include a reduction in habitat effectiveness within a ZOI from the road. For the purposes of this analysis, it was assumed that sage-grouse would be affected by a ZOI 246 ft (75 m) from the roadway. The amount of habitat within this ZOI that would be impacted by Alternative 1 would be the same as the amount impacted under existing conditions (Table 23). Potential indirect effects to sage-grouse due to human presence and noise associated with project activities include displacement of individuals, habitat avoidance, and modifications in behavior. Human activity along roadways and dispersed use beyond the roadway could cause occasional flushing of birds from nests or brood-rearing areas. Under this alternative, these impacts would occur infrequently and only during the duration of road maintenance; therefore, Alternative 1 would have short-term, localized, negligible, adverse effects on the greater sage-grouse.

Cumulative Impacts

Actions occurring on public and private lands within greater sage-grouse suitable habitat that would adversely affect grouse or their habitat include, but are not limited to:

- Oil and gas exploration and development.
- Livestock grazing and sagebrush removal.
- Private land development.
- Road use/management.
- Vegetation management.
- Wildland and prescribed fire.
- Recreation near leks, such as bird-watching.
- Increase in predator populations and in turn, increased predation rates.

In the Jackson Hole area, the condition and extent of wintering habitat may be limiting sage-grouse population growth (Holloran and Anderson 2004). Wintering habitat is characterized by dense, tall sagebrush stands on relatively flat south to west facing slopes and includes areas south of Blacktail Butte (prior to the 2003 wildfire), Wolff Ridge, and the northern portions of the National Elk Refuge. The extent of historical wintering habitats in the Jackson Hole region is difficult to quantify; however, it appears that areas have been eliminated through development, large ungulate grazing of these habitats, and/or prescribed and natural fires (Holloran and Anderson 2004).

The activities listed above cumulatively contribute to increased mortality risks and reduced availability of secure habitat for sage-grouse and would potentially limit sage-grouse population growth in the Jackson Hole region. In the long term, Alternative 1 is not expected to increase loss of habitat to sage-grouse or human presence within sage-grouse habitat that would cumulatively reduce habitat security. Therefore, Alternative 1 would have short-term, localized, negligible, adverse impacts to the greater sage-grouse.

General Wildlife

Mammals

The continued use and maintenance of existing park roads would have both direct and indirect, short- and long-term, localized, minor adverse effects on mammals whose habitats the roads intersect. Under Alternative 1, adverse impacts to mammals would be primarily associated with the risk of vehicle collisions, reduced habitat effectiveness, and fragmentation of habitats.

Direct effects to mammals include vehicle caused mortality and permanent loss of habitat due to paving of roads and/or pullouts. Ungulates residing in and migrating through Grand Teton National Park frequently cross roads and these crossings sometimes result in wildlife-vehicle collisions (WVCs). Park records have documented an average of 31 deer, 25 elk, 9 moose, 5 bison, and 2 pronghorn antelope killed each year based on data from 1992-2005. The number of WVCs occurring in Grand Teton National Park has increased over the 14-year period from 1992 and 2005. This may reflect a true increase in park WVCs or a more consistent reporting effort. Beginning in 2000, a more complete and standardized system for recording and collecting data on the location and nature of WVCs was implemented in the Park (Sarah Dewey 2006, pers comm., GRTE Dispatch). Changes in the

occurrence of WVCs within the Park could also be related to other factors including those related to animal numbers and ecology, traffic volume and speed, and landscape features (Gunther et al. 1998, Bertwistle 1999, Waller et al. 2005), but the link between these variables and the Park trend has not been evaluated. Regardless of the trend the current figures represent minimum road-kill estimates as some WVCs are probably unreported or undetected. WVCs in Teton County showed a comparable increasing trend over a similar period and correlate strongly with increases in traffic levels (Biota 2003). Annual recreational visitation in Grand Teton National Park has been relatively flat over the last decade and is expected to increase only slightly over the next 5 to 10 years. If WVCs in the Park follow a pattern similar to Teton County as a whole, then ungulate road-related wildlife mortalities may also increase over the life of this Final Plan/EIS.

Other mammals are also killed by vehicles on park roads but to a far lesser extent than ungulates. Black bears and coyotes appear to be the most susceptible non-ungulate species to vehicle collisions. Park records documented an average of two black bears and three coyotes killed per year for the period 1992-2005. Overall, the number of ungulates and black bears hit by vehicles on park roads is low and current numbers represent a minor mortality source to park mammals on an annual basis.

Existing roads, trails, and human uses of these linear facilities can displace wildlife and reduce roadside habitat use. The extent to which mammals would be displaced by the existing road system is unknown. Studies of ungulates suggest that animals may habituate to situations when they associate predictable and consistent stimuli with harmless outcomes (Knight and Temple 1995). Elk in protected areas like national parks sometimes adapt to vehicle traffic along roads when their experiences with these disturbances are benign. Winter is the most critical time for wildlife. With the exception of moose, ungulate wintering areas are generally outside of the Park or away from project area roads. For other mammals present in the Park during the winter, this period coincides with the lowest levels of park use by humans.

Roads and the human developments along roads may in some cases be an attractant for some species (e.g., coyotes, bears, etc.), especially if use of these areas has been reinforced by food reward. Carnivores searching for both natural and unnatural food sources in and adjacent to road corridors may be more susceptible to road mortality.

Linear features would also cause some degree of wildlife habitat fragmentation; however, this is one of the least understood impacts in road ecology. Traffic volume and speed, road width, and the presence or absence of fencing influences the extent to which a roadway and system impede connectivity. The current road system has a relatively low posted speed (45 mph on the Teton Park Road and North Park Road, and 55 mph on U.S. Highway 26/89/191), regular patrols to enforce speed limits, a two-lane road surface, and limited use of fencing; these are all characteristics that reduce the likelihood that existing road corridors limit wildlife movements. Overall, Alternative 1 would have long-term, localized, minor, adverse impacts to mammals.

Amphibians and Reptiles

Activities occurring under Alternative 1 would have the lowest impact of those considered in this document on amphibians and reptiles. Under Alternative 1, maintenance of existing roads would occur and be confined to roadways. No vegetation or suitable breeding habitat would be removed. Direct mortality of adult amphibians or reptiles that occupy areas within the project area could result due to human activities and operation of equipment; however, these effects would be negligible and short term. Overall, activities associated with Alternative 1 would have long-term, localized, negligible, adverse impacts to amphibians and reptiles in the Park.

Cumulative Impacts (General Wildlife)

Cumulative impacts to wildlife could result from other developments and use of the Park, such as construction of new facilities and recreational intrusion into habitats. Historic and current park management practices emphasize natural ecosystem processes so that development has been minimized and much of the historical development in the Park has been removed and reclaimed. Existing and future development within Grand Teton National Park is not expected to adversely impact wildlife populations. Traffic and recreational use, and the associated noise and human presence within Grand Teton National Park, could adversely impact individual animals but are not likely to adversely affect populations.

Cumulative impacts of other past, present, and future projects in and around the Park have the potential of adversely affecting wildlife. These impacts primarily involve the loss or degradation of habitat. Within the Park, these projects include construction of a new visitor center at Moose, replacement of the Moose Entrance Station, construction of the LSR Preserve, upgrades to Jenny Lake



Lodge visitor accommodations and employee housing facilities, reconstruction and widening of North Park Road between Lizard Creek Campground and the South Entrance of Yellowstone, replacement of the Snake River Bridge near Flagg Ranch, and the chip-and-seal project from Moran to Jackson Lake Lodge.

Residential development on private land has increased dramatically in recent years, and this trend is expected to continue into the near future. Despite these residential and recreational increases, mammal populations within Jackson Hole, including Grand Teton National Park, appear to have remained relatively stable or increased. Development of riparian areas and wetlands has resulted in impacts to reptiles and amphibians. However, wetland protection administered by the ACOE and by county government is believed to be sufficient to protect the integrity of amphibians and reptiles on private land in Jackson Hole.

Declining amphibian populations have been documented worldwide and are thought to be particularly acute in western North America. These declines have been attributed to habitat disturbance, including pollution, fish introduction, and habitat degradation. There is also growing interest in infectious diseases and their role in global amphibian declines (Daszak et al. 1999). In particular, chytrid fungus, a contagious disease found in various frogs, toads, and salamanders, has been thought to be the cause of heightened mortality leading to mass amphibian die-offs in six continents, including North America. Montane and pristine areas in the western United States have not been immune to the fungus. In fact, two toad species once common in the Rocky Mountains, including boreal toads in Rocky Mountain National Park, have likely been decimated by the disease (Muths et al. 2003). Cases of chytrid-infected amphibians in Wyoming and Montana, as well as in Colorado, have indicated the distribution of the disease is throughout the Rocky Mountains and has the potential to be detrimental to amphibian populations in these areas. A pilot project conducted in Grand Teton National Park during the summer of 2004 identified chytrid fungus on the skin of boreal toads and spotted frogs; however, it did not appear to affect the health or survival of infected animals (Wolff 2004).

Overall, the impacts from past, present, and future actions, in conjunction with the effects of Alternative 1, would result in long-term, localized, minor to moderate, adverse impacts to general wildlife.

Conclusion (Threatened and Endangered (Federally Listed) Species, Bird Species of Special Concern, and General Wildlife)

Threatened and Endangered (Federally Listed) Species

Alternative 1 “may affect, but is not likely to adversely affect” the bald eagle, Canada lynx, or yellow-billed cuckoo. Alternative 1 is “likely to adversely affect” the grizzly bear and gray wolf because vehicle collisions may occur that would adversely affect one or more individuals; however, the alternative would not threaten the survival of either species.

Bird Species of Special Concern

Alternative 1 would have long-term, localized, negligible, adverse impacts on bird species of special concern, neotropical migratory birds, and greater sage-grouse. Cumulative impacts would be negligible and adverse.

General Wildlife

Alternative 1 would result in long-term, localized, negligible to minor, adverse impacts to mammals, reptiles, and amphibians from continued use of park roads and trails due to displacement from and/or avoidance of habitats adjacent to existing roads. Direct mortality levels are not expected to increase under this alternative; however, it is likely that vehicles using park roads would continue to strike and kill individual mammals. Cumulative impacts would be long term, minor to moderate, and adverse, with Alternative 1 adding a negligible amount to overall cumulative impacts.

Because there would be no major, adverse impacts to wildlife resources or values, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park’s GMP or other relevant NPS planning documents, there would be no impairment of the Park’s wildlife resources, including any listed species or species of special concern.

Effects of Alternative 2 — Improved Road Shoulders

Endangered and Threatened Species (Federally Listed Species)

Bald Eagle

Similar to Alternative 1, no direct adverse impacts to bald eagles would result from implementing Alternative 2. The proposed shoulder widening along the Teton Park Road between Moose and Signal Mountain would not directly

affect bald eagle nesting, foraging, or wintering habitat. Construction of improved shoulders would not occur within 0.5 mile (0.8 km) of known bald eagle nests. Road widening in the vicinity of the Snake River near Moose Bridge and near Cottonwood Creek would be confined to the existing roadway.

Indirect effects from construction activities and increases in road use by pedestrians and bicyclists would cause a reduction in habitat effectiveness within a 1,312-ft (400-m) ZOI (see Alternative 1 analysis for discussion on bald eagle ZOIs). The amount of habitat within this ZOI that would be impacted by Alternative 2 would be the same as the amount impacted from existing conditions (Table 23). Disturbance from human presence, noise, and recreation along the roadway and from dispersed use off of the roadway could displace eagles or occasionally flush birds from perches in areas that contain suitable eagle habitat, such as near Moose Bridge and Cottonwood Creek. Other indirect effects from human disturbance would include modifications of behavior, habitat avoidance, and possibly changes in reproductive success. Activities associated with shoulder construction would be short term; however, pedestrian and bicyclist use along roadways would be long-term. Impacts from Alternative 2 would be similar to those of Alternative 1.

Cumulative Impacts

Cumulative impacts to bald eagles associated with Alternative 2 would be generally the same as those identified in Alternative 1. Any disturbances to bald eagles from road shoulder construction would have minor cumulative impacts. Vehicle use of Grand Teton National Park roads, and pedestrian and bicyclist use of proposed improved shoulders, would contribute only negligibly to cumulative impacts. Overall, long-term cumulative impacts to bald eagle populations would be none to minor.

Impact Determination and Summary of Rationale

Under Alternative 2, human presence, noise, vehicular road use, and activities associated with road shoulder widening would displace individual bald eagles; however, given that the project area is outside of bald eagle nest territories, these effects are expected to be none to minor. No actions are proposed in this alternative that would affect important bald eagle wintering or foraging habitats. Overall, impacts to local and regional bald eagle populations under Alternative 2 are expected to be long-term, localized, and minor. Therefore, this alternative “may affect, but is not likely to adversely affect” bald eagles.

Canada Lynx

Direct and indirect effects to lynx resulting from Alternative 2 would be similar to those described for Alternative 1 (i.e., none to minor and adverse). In addition to the effects from existing conditions, Alternative 2 includes widening of roadway shoulders along approximately 17.8 miles (28.6 km) of the Teton Park Road between Moose and Signal Mountain, which would involve removal of a small amount of vegetation. A 1-mile section of road from Signal Mountain turnoff to Signal Mountain Lodge is within the Two Ocean LAU, and mapped lynx habitat occurs adjacent to the roadway in this area. A small amount (less than 1 acre) of lynx habitat would be lost; however, this loss would occur adjacent to the existing road and large patches of forested cover would remain intact nearby. Therefore, the direct loss of habitat would be minor. Indirect impacts associated with construction of improved shoulders and use of the roadside by more pedestrians and bicyclists would include human-caused displacement and possibly other behavior modifications. Approximately 3.8 acres (1.5 ha) of coniferous forest habitat would be affected by the 1,312-ft (400-m) ZOI associated with Alternative 2. How lynx respond to increased recreation use is likely to depend upon the activities in which people participate. Activities that are predictable would allow animals to habituate to them. Those that are noisier (i.e., that allow the animal to detect recreationists), short in duration, and where recreationists do not directly approach the animal have the least impact. Because of the increased recreation use anticipated and a slightly larger transportation footprint expected under this alternative, the loss in habitat effectiveness in the road corridors ZOI is expected to be greater than under Alternative 1, but less than those associated with the other action alternatives. Anticipated vehicle traffic levels on roads in the Park would be similar to Alternative 1, and these levels represent a minor potential source of mortality for Canada lynx.

Cumulative Impacts

Other activities occurring in the GYA that would affect lynx or their habitat include timber management, wildland fire management (including prescribed burns both inside and outside the Park), grazing (outside and within the Park), winter recreation, and trapping of other furbearers. With the exception of trapping, all of these activities have the potential to affect forest successional stages, and consequently, snowshoe hare and lynx.

Cumulative impacts to Canada lynx associated with Alternative 2 would be generally the same as those identified in Alternative 1. Road density within the Park would not increase because of the proposal, although the physical



footprint and the effect zone would increase slightly. Any disturbances to lynx from road shoulder construction would represent a none to minor contribution to cumulative impacts. Vehicle use of Grand Teton National Park roads, and pedestrian and bicyclist use of proposed improved shoulders, would contribute only minor cumulative impacts.

Impact Determination and Summary of Rationale

Under Alternative 2, human presence and noise associated with routine maintenance and continued use of the transportation system would displace individual lynx; however, because most of the project area is outside of mapped lynx habitat, effects are expected to be long term, localized, and minor. No actions are proposed in this alternative that would affect important lynx linkage areas. The likelihood of a lynx being struck and killed by a vehicle is anticipated to be low because lynx likely occur in the Park at low densities, if at all, and to date no vehicle mortalities have been reported. Impacts to lynx or lynx habitat are expected to be greater than those described under Alternative 1 but are still expected to be minor. Therefore, Alternative 2 “may affect, but is not likely to adversely affect” Canada lynx.

Grizzly Bear

Direct and indirect effects to grizzly bear resulting from Alternative 2 would be similar to those resulting from Alternative 1, with the following exceptions: direct impacts associated with the proposed approximately 17.8 miles (28.6 km) of improved road shoulder along the Teton Park Road would involve removal of a small amount of vegetation, and thus direct habitat loss (Tables 19 and 22) adjacent to the existing road. While several studies suggest bears tend to avoid road corridors (Mace et al. 1996, McLellan et al. 1988), in Yellowstone and Grand Teton National Parks, where grizzly bear use of roadside habitats is tolerated, mounting evidence suggests these areas may be important to one or more individual bears annually (M. Haroldson 2006, pers. comm., S. Cain 2006, pers. comm.). Indirect impacts associated with construction of improved shoulders and use of the roadside by more pedestrians and bicyclists would include human-caused displacement of bears from areas adjacent to improved roads, habituation to humans, and possibly other behavior modifications. However, use of the roadsides by more people would make it more difficult for bears to habituate to this less predictable activity; thus, the loss in habitat effectiveness in the roads’ ZOI could be expected to be greater than under Alternative 1. An increase in off-trail use associated with pathway access would further reduce habitat effectiveness by an unknown but perhaps moderate amount at times.

The creation of non-motorized corridors (i.e., expanded road shoulders) in this alternative is expected to result in an increase in non-motorized use of these areas. Bear-human encounters in these areas would probably increase both because of increased human use and because of the added surprise factor that quiet, non-motorized use represents. This is particularly true where roads and pathways traverse habitats where terrain and/or vegetation limit sight distances, or where noise from streams can cover noise of approaching humans. The risk of serious human injuries from such encounters would increase; however, their frequency of occurrence cannot be predicted.

Increasing access in grizzly bear habitat for large numbers of the public (potentially carrying food) also creates additional opportunities for bears to become conditioned to human food (Herrero 1985). Experience in the Park has shown that food-storage regulation compliance is poorest and hardest to enforce among dispersed recreationists. Therefore, while education efforts would help mitigate this potential, some bears would become conditioned to human food. Bears that become conditioned to human food usually become a threat to human safety and ultimately need to be destroyed. Because this alternative would provide more non-motorized access (through expanded road shoulders) in grizzly bear habitat than Alternative 1, it would result in higher potential for bear mortality associated with human food conditioning. Improving social trails in and near campgrounds would keep visitors from straying to less developed areas that bears could inhabit, but otherwise would have no effect.

Most of these adverse impacts would be considered moderate, long-term, and localized; however, impacts from vehicle mortality and potential mortality from human conditioning could be considered moderate because this could affect one or more bears but would not threaten the survival of the species.

Cumulative Impacts

Cumulative impacts to grizzly bears associated with Alternative 2 would be generally the same as those identified in Alternative 1. Any disturbances to grizzly bears from road shoulder construction would contribute only negligibly to cumulative impacts. Vehicle use of Grand Teton National Park roads, and pedestrian and bicyclist use of proposed improved shoulders, would contribute only negligibly to cumulative impacts. Overall, long-term cumulative impacts to grizzly bears in the GYA population would be minor.

Mitigation Measures

- “Bearwise” education would be conducted with all personnel involved in road and pathway construction and maintenance projects.
- All food and other attractants would be properly stored at all times, and all food materials, garbage, and other attractants would be packed out on a daily basis if they cannot be stored in bear-resistant containers.
- Project crews (other than law enforcement personnel) would not carry firearms.
- Project crews would carry bear pepper spray when conducting project activities and would be trained in bear safety.
- All project crews working in grizzly bear habitat would meet standards for sanitation, attractant storage, and access.
- All grizzly bear/human confrontations would be reported to Science and Resource Management personnel.

Effects Determination and Summary of Rationale

Alternative 2 is not expected to have substantial adverse population level impacts on grizzly bears nor would it jeopardize the recovery of grizzly bears within the GYA. However, the inclusion of expanded road shoulders in grizzly bear habitat (Figure 24), some of which have limited sight distances, would reduce habitat effectiveness, increase potential for habituation and/or food conditioning by some bears, and increase the potential for bear mortalities associated with management removals. It is also reasonable to expect that one or more grizzly bears could be hit and killed by vehicles using park roads during the lifetime of this Plan. Therefore, impacts to the Park and Greater Yellowstone grizzly bear population under Alternative 2 would be long-term, localized, and moderate since one or more individual bears are “likely to be adversely affected” by this alternative.

Gray Wolf

Direct and indirect effects to wolves resulting from Alternative 2 would be similar to those resulting from Alternative 1, with the following exceptions: direct impacts associated with the proposed approximately 17.8 miles (28.6 km) of improved road shoulder along the Teton Park Road would involve removal of a small amount of vegetation, and thus direct habitat loss for some potential wolf prey species (Table 19 and 22). However, this loss would occur adjacent to the existing road and because

both ungulates and wolves largely avoid the road corridor, the loss in habitat effectiveness would be minor.

Indirect impacts associated with use of the roadside by more pedestrians and bicyclists would include human-caused displacement of wolves from areas adjacent to improved roads, habituation to humans, and possibly other behavior modifications. However, use of the roadsides by more people would make it more difficult for wolves to habituate to this less predictable activity; thus, the loss in habitat effectiveness in the roads’ ZOI could be expected to be greater than under Alternative 1. An increase in off-trail use associated with pathway access would further reduce habitat effectiveness by an unknown but perhaps moderate amount at times. Improving social trails in and near campgrounds would have no effect on wolves.

Most of these adverse impacts would be considered minor, long-term, and localized; however, impacts from vehicle mortality could be considered moderate because this could affect one or more wolves but would not threaten the survival of the species.

Cumulative Impacts

Cumulative impacts to gray wolves associated with Alternative 2 are expected to be similar to those identified in Alternative 1. Vehicle use of existing Grand Teton National Park roads and bicyclist and pedestrian use of new improved shoulders along the Teton Park Road are not expected to contribute to cumulative impacts on wolves. The cumulative impacts of existing residential activities, and possible future development occurring on park in-holdings and properties near Grand Teton National Park, are likely to be minor. Overall, long-term impacts to gray wolves would be minor, and the contribution of impacts resulting from Alternative 2 to gray wolf cumulative impacts would remain minor.

Effects Determination and Summary of Rationale

Alternative 2 is not expected to have substantial adverse population level impacts on wolves nor would it jeopardize the recovery of wolves within the GYA. However, habitat security would be reduced, and it is reasonable to expect that one or more wolves could be struck and killed by vehicles using park roads during the lifetime of this Plan. Therefore, impacts to the Park and Greater Yellowstone wolf population under Alternative 2 would be long-term, localized, and moderate since one or more individual wolves are “likely to be adversely affected” by this alternative.



Yellow-billed Cuckoo

Similar to Alternative 1, no direct adverse impacts to yellow-billed cuckoo would result from implementing Alternative 2. The proposed shoulder widening along the Teton Park Road would not occur near any known cuckoo nesting or foraging habitats; however, a small amount of potential cuckoo habitat would be permanently removed including cottonwood and riparian forest as well as willow habitat (0.02 acres [0.008 ha]; Appendix B). Road shoulder widening in the vicinity of the Snake River near Moose Bridge and near Cottonwood Creek would be confined to the existing roadway.

Indirect effects from construction activities and increases in road use by pedestrians and bicyclists would cause a reduction in habitat effectiveness within a 246-ft (75-m) ZOI (see Alternative 1 analysis for discussion on cuckoo ZOIs). Approximately 0.2 acre (0.1 ha) of cottonwood and riparian forest and willow habitat (Appendix B) would be potentially impacted within this ZOI; however, the amount of habitat impacted by Alternative 2 would be the same as existing conditions (Table 23). The effects that construction, human presence, noise, and recreation along the roadway and from dispersed use off the road would have on cuckoos within the ZOI are relatively unknown but would include displacement of individuals, changes in behavior, reduction in breeding and reproduction success, and movement to less desirable habitats.

Impacts from Alternative 2 would be expected to be greater than under Alternative 1 and have no long-term effects on yellow-billed cuckoos, although no cuckoos have been reported in the project area.

Cumulative Impacts

Cumulative impacts to yellow-billed cuckoos associated with Alternative 2 would be generally the same as those identified in Alternative 1. The amount of habitat removed would be small and would be along the existing road corridor; therefore, the loss of this habitat would not significantly contribute to habitat fragmentation. Cumulative impacts from disturbances during road shoulder construction would have only minor cumulative impacts. Vehicle use of Grand Teton National Park roads, and pedestrian and bicyclist use of proposed improved shoulders, would have only minor cumulative impacts. Overall long-term cumulative impacts to yellow-billed cuckoo populations would be none to minor.

Impact Determination and Summary of Rationale
Under Alternative 2, human presence, noise, and activities

associated with road shoulder widening could displace individual yellow-billed cuckoos; however, because no known cuckoo breeding or nesting territories are located within the project area, these effects are expected to be none. No actions are proposed in this alternative that would affect important yellow-billed cuckoo nesting or foraging habitats. Overall, impacts to yellow-billed cuckoo populations under Alternative 2 are expected to be long-term, localized, and minor. Therefore, this alternative “may affect, but is not likely to adversely affect” yellow-billed cuckoo.

Bird Species of Special Concern (Not Federally Listed) and Neotropical Migratory Birds

Neotropical Migratory Birds/Birds Species of Special Concern

Direct and indirect effects to bird species of special concern and/or neotropical migratory birds resulting from Alternative 2 would be similar to those described in Alternative 1. In addition to the effects from existing conditions, a direct loss of approximately 13.3 acres (5.4 ha) of vegetation would occur due to shoulder widening in habitats such as sagebrush, cottonwood, willow, barren land, and conifer forests (Appendix B). The removal of these habitats would impact breeding, nesting, brood-rearing, and year-round foraging habitat of several bird species that depend on these habitat types; however, because the amount of direct habitat loss is small, these impacts would be negligible. The most impacted habitat other than barren land would be sagebrush (0.58 acres [0.2 ha]). Birds that use this habitat type include sagebrush obligate and near obligate species. Nests, eggs, or young could be impacted if construction of road shoulders occurs during the breeding season (mid-May through mid-July); therefore, mitigation measures to reduce these losses would be implemented, as discussed below.

Indirect impacts associated with the construction of road shoulders and their use by pedestrians and bicyclists would include a reduction in habitat effectiveness within a 246-ft (75-m) ZOI from the road (see Alternative 1 discussion on bird species of concern and neotropical migratory bird species ZOIs). Within the 12.1 acres (4.9 ha) in this ZOI, are a variety of habitats (Table 19; Appendix B), and therefore several different bird species, would be affected. The most impacted habitat other than barren land, would be sagebrush, thus those birds using this habitat would be most impacted. The effects that this disturbance would have on birds within the ZOI would be variable and

difficult to quantify. Studies have shown that individual songbirds respond differently to human disturbance and that responses depend on species, sex, and age of the individual and on the time of year and quality of adjacent habitat (Knight and Temple 1995, Gutzwiller et al. 1998). Potential response to human disturbance by passerine birds includes habitat avoidance, nest abandonment, reproductive failure, and modifications in behavior (Boyle and Samson 1985, Knight and Temple 1995, Miller et al. 1998, Paige and Ritter 1999). Recreational disturbance to diurnal raptors has also been shown to disrupt behavior when it deters foraging or flushes birds from foraging perches and roosts (Holmes et al. 1993). Additionally, species richness and abundance may change in areas adjacent to human presence along the proposed widened shoulder. For example, avian predators have been shown to increase in areas of human intrusion resulting in a decline of songbird abundance and diversity (Martin 1988, Angelstam 1986, Buhler and Anderson 1999). Recreational use along the roadway and dispersed use off the road could further reduce habitat effectiveness by an unknown, but perhaps moderate, amount at times (Figure 22). Although individual human disturbances would be brief in time, repeated encounters could have long-term impacts. Overall, impacts to bird species of special concern and/or neotropical migratory birds from Alternative 2 would be long-term, localized, negligible, and adverse.

Cumulative Impacts

Cumulative impacts to birds under Alternative 2 would be generally the same as those described in Alternative 1. Alternative 2 would contribute to the loss of habitat; however, effects would be confined to the areas along the Teton Park Road between Moose and Signal Mountain. Habitat removed from Alternative 2 would primarily be sagebrush, thus bird species that use this habitat would be most impacted. Many of these species have shown range-wide declines due to habitat loss, fragmentation, increases in predation and parasitism, and other unknown factors. Because only a small amount of sagebrush would be removed as a result from Alternative 2, cumulative impacts would be negligible. Overall, any disturbances to birds from road shoulder construction would contribute negligibly to cumulative impacts. Vehicle use of Grand Teton National Park roads, and pedestrian and bicyclist use of proposed improved shoulders, would contribute negligibly to cumulative impacts. Long-term cumulative impacts to bird species of special concern and/or other neotropical migratory bird populations would be negligible.

Mitigation Measures

To minimize the potential for “taking” a nest or egg of a migratory bird species, either (1) any activity that would destroy a nest or egg would occur after July 15 (a timeframe outside of the primary nesting season), or (2) a survey for any nests in the project area would be conducted prior to these activities.

Greater Sage-Grouse

Direct and indirect effects to greater sage-grouse resulting from Alternative 2 would be similar to those described for Alternative 1. In addition to the effects from existing conditions, Alternative 2 includes improving road shoulders on the Teton Park Road between Moose Junction and Signal Mountain Lodge (approximately 17.8 miles [28.6 km]) to provide increased access for bicycling. Direct impacts from Alternative 2 would include permanent loss of 0.58 acres (0.2 ha) of sagebrush habitat from Moose to Signal Mountain (Appendix B), although this loss would occur adjacent to the existing road. Sage-grouse have been reported using areas along the road from Moose to North Jenny Lake. No direct effects would occur to known sage-grouse lekking, nesting, brood-rearing, or wintering areas under Alternative 2.

Indirect impacts associated with the construction of road shoulders and their use by pedestrians and bicyclists include a reduction in habitat effectiveness within a ZOI (see Alternative 1 for discussion on sage-grouse ZOIs). An estimated 8.76 acres (3.6 ha) of sagebrush habitat would be impacted within this ZOI along the Teton Park Road from Moose to Signal Mountain, (Appendix B). Sagebrush habitat along the Teton Park Road is considered potential sage-grouse nesting and brood-rearing habitat, and could, therefore, be impacted by activities associated with Alternative 2.

Indirect effects to sage-grouse due to human presence and noise associated with project activities include displacement of individuals, habitat avoidance, and modifications in behavior. Human activity along roadways and dispersed use beyond the roadway could cause occasional flushing of birds from nests or brood-rearing areas. Although impacts during construction would be short-term, repeated human disturbance from recreational use along improved shoulders would be long-term. As a result, impacts from Alternative 2 would have long-term, localized, negligible to minor, adverse impacts to the greater sage-grouse.



Cumulative Impacts

Cumulative impacts to greater sage-grouse associated with Alternative 2 would be generally the same as those identified in Alternative 1. Alternative 2 would contribute to the loss of sagebrush habitat; however, this loss would be confined to the areas along the Teton Park Road. Any disturbances to sage-grouse from road shoulder construction would contribute negligibly to cumulative impacts. Vehicle use of Grand Teton National Park roads, and pedestrian and bicyclist use of proposed improved shoulders, would contribute negligibly to cumulative impacts. Overall long-term, cumulative impacts to greater sage-grouse in the Jackson Hole population would be negligible.

General Wildlife

Mammals

In addition to the effects from continued use and maintenance of existing roadways, Alternative 2 includes widening of roadway shoulders along approximately 17.8 miles (28.6 km) of the Teton Park Road between Moose and Signal Mountain. Approximately 13.3 acres (5.4 ha) of native vegetation, mainly barren land and sagebrush, would be removed permanently (Table 19). Sagebrush habitats are important to a wide range of mammals, including all the native ungulates and a number of carnivores and small mammals. The actual amount of habitat lost would be small and would occur immediately adjacent to the existing road corridor, but because the corridor would increase in width, edge effects would increase. This would enhance habitat for generalist species (e.g., coyotes, black bears) but would further degrade habitats for specialist species (e.g., forest dwelling species). In the short term, construction-related activity would likely temporarily displace any mammals present from habitat adjacent to the road; however, they would resume use in some areas once reclamation and revegetation activities are complete.

The primary additional impact to mammals in the long term under Alternative 2 would be disturbance due to the increased level of recreation (mainly bicyclists) on the roadway. Widening of the road shoulder would increase the footprint of the roadway and its ZOI on adjacent habitats. The construction of improved shoulders is expected to result in an increase in non-motorized recreation use, which could result in increased disturbance impacts as well as increased potential for conflicts with wildlife.

Responses of wildlife to human activities vary by individual and species. An individual animal's response may vary

according to the season, age and sex, body size, group size, behavioral response of cohorts, or habitat security (Knight and Temple 1995). Behavioral responses are influenced by the characteristics of the disturbance itself (type, distance away, direction of movement, speed, predictability, and frequency) and location (open habitat areas versus those screened by topography or vegetation), as well as the tolerance of the species or individual to disturbance. Recent experimental measurement of the effects of off-road recreation on mule deer and elk found that elk displayed more pronounced reactions to all-terrain vehicles (ATVs) and mountain bikers than horseback riders or pedestrians (Wisdom et al. 2004). In general, recreational activities had a substantial effect on elk behavior; however, it is unclear what the energetic costs associated with these disturbances may be. Mule deer showed little response in terms of movement rates but may respond to off-road activity by seeking denser cover, which could result in reduced foraging opportunities (Wisdom et al. 2004). Taylor and Knight (2003) observed that mule deer, bison, and pronghorn antelope exhibited a high probability of flushing from on-trail recreationists when encountered at close range (within 327 ft [100 m]). They identified a 654-ft (200-m) area of influence along trails. ZOIs up to 4,263 ft (1,300 m) have been identified for elk along roads (Gaines et al. 2003).

Areas adjacent to the Teton Park Road from Moose to North Jenny Lake Junction are important to elk for feeding and as rutting sites, and to bison, pronghorn, and mule deer for feeding. Under this alternative, both the 246-ft (75-m) and 1,312-ft (400-m) ZOIs would increase by approximately 13.3 acres (5.4 ha) and 72.5 acres (29.3 ha), respectively (Table 23). Because recreationists could stop at any point along the pathway to approach wildlife or enter occupied habitats, however, disturbance levels within the ZOI are expected to be higher than under Alternative 1. An increase in off-trail use associated with increased levels of recreation users in the road corridor would further reduce habitat effectiveness by an unknown, but perhaps moderate, amount at times (Figure 22). Although, some studies suggest that ungulates and other wildlife may habituate to the presence of humans, it is unknown how they would respond to relatively unpredictable activities. In addition, habituation can lead to an increase in wildlife-human conflicts (e.g., elk in the townsite of Banff, Canada) and an escalation of management actions (e.g., removal, hazing, relocation, etc.) to improve human safety. Alternative 2 is not expected to have significant population level impacts on mammals, although it is likely that individuals and groups of individuals in specific areas would be influenced by disturbance impacts.

Motor vehicle traffic levels on roads in Grand Teton National Park are expected to be similar to Alternative 1 and represent a minor potential source of mortality to mammals. Although wildlife-vehicle collisions usually cause the death of an animal, they occur relatively infrequently and do not adversely affect mammals at a population level. Overall, Alternative 2 would have long-term, localized, minor, adverse impacts to mammals.

Reptiles and Amphibians

Direct and indirect effects to amphibians and reptiles resulting from Alternative 2 would be similar to those described in Alternative 1. In addition to the effects from existing conditions, Alternative 2 includes widening of roadway shoulders along approximately 17.8 miles (28.6 km) of the Teton Park Road between Moose and Signal Mountain, and removing an estimated 13.3 acres (5.4 ha) of vegetation (Appendix B). Approximately 0.02 acres of wetland habitat would occur from the proposed shoulder widening. Although no known amphibian or reptile breeding sites occur within the project area, if construction does occur near a wetland that may be a potential amphibian breeding area, measures would be taken to prevent damage caused by construction equipment, erosion, siltation, or other activities. The removal of vegetation for shoulder widening could cause direct impacts to amphibians or reptiles that use these areas to forage or for cover. Direct and indirect mortality of adult amphibians or reptiles due to human activities and operation of equipment could occur. Overall, impacts to reptiles and amphibians from Alternative 2 would be short term, localized, and negligible.

Cumulative Impacts (General Wildlife)

Cumulative impacts to general wildlife under Alternative 2 would be similar to those identified in Alternative 1 (i.e., long term, minor to moderate, and adverse). The contribution of impacts resulting from Alternative 2 to cumulative impacts would be negligible.

Conclusion (Threatened and Endangered (Federally Listed) Species, Bird Species of Special Concern, and General Wildlife)

Threatened and Endangered (Federally Listed) Species

Alternative 2 “may affect, but is not likely to adversely affect” the bald eagle, Canada lynx, and yellow-billed cuckoo. Alternative 2 is “likely to adversely affect” the grizzly bear and gray wolf because vehicle collisions or mortality related to human conditioning (i.e., for bears)

may occur that would adversely affect one or more individuals; however, the alternative would not threaten the survival of either species.

Bird Species of Special Concern

Alternative 2 would have long-term, localized, negligible, adverse impacts on bird species of special concern and neotropical migratory birds, and long-term, localized, negligible to minor, adverse effects on the greater sage-grouse. Cumulative impacts would be long-term, negligible, and adverse.

General Wildlife

Alternative 2 would result in long-term, localized, negligible to minor, adverse impacts to mammals, reptiles, and amphibians from continued use of park roads and construction of shoulder widening along a portion of the Teton Park Road. Although the amount of direct habitat loss is less under this alternative than the other action alternatives, the construction of improved shoulders to accommodate bicycle traffic is likely to lead to an increase in recreation use and consequently levels of disturbance. The potential for human-wildlife conflicts and associated management actions would be higher than under Alternative 1, again due to increased recreation use levels. Direct mortality levels are not expected to increase under this alternative; however, it is likely that vehicles using park roads would continue to strike and kill individual mammals. Although no adverse population level impacts to mammals, reptiles, or amphibians are anticipated, effects to local species distributions and habitat use patterns are likely, but to a lesser degree than in Alternatives 3, 3a, or 4. Cumulative impacts would be long term, negligible, minor to moderate, and adverse, with Alternative 2 adding little to overall cumulative impacts.

Because there would be no major, adverse impacts to wildlife resources or values, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park’s GMP or other relevant NPS planning documents, there would be no impairment of the Park’s wildlife resources, including any listed species or species of special concern.

Effects of Alternative 3 — Improved Road Shoulders / Multi-Use Pathways

Endangered and Threatened Species (Federally Listed Species)



Bald Eagle

No direct adverse impacts to bald eagles would result from implementing Alternative 3. The improved road shoulder and multi-use pathway outside the road corridor would not directly affect bald eagle nesting, foraging, or wintering habitat. Construction of improved shoulders and multi-use pathways would not occur within one-half mile (0.8 km) of known bald eagle nests. The development of multi-use pathways in the vicinity of the Snake River near Moose Bridge, along Cottonwood Creek, and Jackson Lake Dam would be confined to the existing roadway. The road realignment on the Moose-Wilson Road would not be constructed within bald eagle habitat.

Indirect effects from construction activities, pedestrians and bicyclist use along pathways, and improved shoulders would cause a reduction in habitat effectiveness within the ZOI (see Alternative 1 analysis for the definition of ZOIs for bald eagles). Disturbance from human presence, noise, and recreation along the roadway and pathways, as well as from dispersed use off the pathways, could displace eagles or occasionally flush birds from perches in areas that contain suitable eagle habitat, such as near Moose Bridge, Cottonwood Creek, and at Jackson Lake Dam. Other indirect effects from human disturbance would include modifications of behavior, habitat avoidance, and possibly changes in reproductive success. Activities associated with shoulder and pathway construction would be short term; however, pedestrian and bicyclist use along roadways and pathways would be long-term. Impacts from Alternative 3 would be greater than those from Alternative 1 and similar to those from Alternative 2. These impacts would have long-term, localized, minor, adverse effects on bald eagles.

Cumulative Impacts

Cumulative impacts to bald eagles associated with Alternative 3 would be generally the same as those identified in Alternatives 1 and 2. Cumulative impacts to bald eagles from pathway and improved shoulder construction would be minor. Vehicle use of Grand Teton National Park roads and pedestrian and bicyclist use of proposed pathways would have minor cumulative impacts. Overall long-term cumulative impacts to bald eagle populations would be minor.

Impact Determination and Summary of Rationale

Under Alternative 3, human presence, noise, and activities associated with pathway and shoulder construction would displace individual bald eagles; however, given that the project area is outside of bald eagle nest territories, these effects are expected to be minor. No actions are proposed

in this alternative that would affect important bald eagle wintering or foraging habitats. Overall, impacts to local and regional bald eagle populations under Alternative 3 are expected to be long-term, localized, minor, and adverse. Therefore, this alternative “may affect, but is not likely to adversely affect” bald eagles.

Canada Lynx

Direct and indirect effects to Canada lynx resulting from Alternative 3 would be similar to those described for Alternatives 1 and 2, including direct mortality and direct and indirect impacts to lynx habitat. Overall impacts would be long-term negligible to minor and adverse.

In addition to effects resulting from continued use and maintenance of the existing transportation system, Alternative 3 involves construction of approximately 15.5 miles (25.0 km) of improved shoulders along the Teton Park Road between North Jenny Lake and Colter Bay. A portion of the Moose-Wilson Road would be realigned and the old road alignment restored. Multi-use pathways would be constructed in three segments totaling approximately 23.3 miles (37.3 km). These segments are proposed along U.S. Highway 26/287/191 from the south boundary to Antelope Flats Road, the Teton Park Road from Moose Junction to North Jenny Lake Junction, and along the Moose-Wilson Road from the Granite Canyon Entrance Station to the LSR Preserve. Shoulder widening would result in a direct loss of 1.09 acre (0.44 ha) (Appendix B, Table B-1) of conifer-forest vegetation types. 0.5 acres (0.2 ha) of this loss would occur between North Jenny Lake turnoff and Colter Bay, a portion of which is in the Two Ocean and Steamboat LAUs. Conifer habitats represent potential habitat for lynx. This amount of habitat loss would be minor given the large amount of coniferous forest remaining that would not be impacted.

Disturbance impacts to lynx could occur from noise and human presence associated with construction of the shoulders and pathways and their subsequent use, especially in contiguous conifer habitats that are primary habitat for lynx such as those along the Moose-Wilson Road and between Signal Mountain and Colter Bay. Pathway and shoulder construction and use would extend the road corridor’s ZOI and could result in an indirect loss of lynx habitat. An estimated 33.5 acres (13.5 ha) of coniferous forest habitat would be affected by the 1,312-ft (400-m) ZOI associated with actions under Alternative 3. Lynx are generally crepuscular animals (active at twilight or before sunrise) and may rest in secure habitat during the day and emerge at night to use areas where human activity

has stopped or decreased. Consequently, because pathway use would occur only during daylight hours, disturbance impacts to lynx habitats adjacent to the road and pathway corridors are expected to be minimal.

Motor vehicle traffic levels under this alternative are expected to be similar to those predicted under the other alternatives and represent a minor potential source of mortality for lynx. The overall risk of direct mortality is not expected to increase from pathway construction and use.

Cumulative Impacts

Other activities occurring in the GYA that would affect lynx or their habitat include timber management, wildland fire management (including prescribed burns both inside and outside the Park), grazing (outside and within the Park), winter recreation, and trapping of other furbearers. With the exception of trapping, all of these activities have the potential to affect forest successional stages, and consequently, snowshoe hare and lynx.

Cumulative impacts to Canada lynx associated with Alternative 3 would be generally the same as those identified in Alternatives 1 and 2. Although road density would not increase under this alternative, the overall density of linear features would increase with an addition of approximately 23.3 miles (37.3 km) of multi-use pathways. The physical footprint of the road would increase slightly, and construction of the pathway would result in additional direct habitat loss and reduced habitat effectiveness. Disturbance to lynx from road shoulder construction would represent a minor contribution to cumulative impacts. Vehicle use of Grand Teton National Park roads, and pedestrian and bicyclist use of proposed improved shoulders, would contribute only minor cumulative impacts.

Effects Determination and Summary of Rationale

Under Alternative 3, a small amount of lynx habitat would be directly lost due to construction. In addition, individual lynx may also be displaced by human presence and noise associated with routine maintenance; shoulder and pathway construction and use; road realignment; and continued use of the transportation system. Effectiveness of lynx habitat may also be reduced where it is adjacent to non-motorized routes. The likelihood of a lynx being struck and killed by a vehicle is anticipated to be low. Lynx likely occur in the Park at low densities, if at all, and no vehicle mortalities have been reported to date. Impacts to lynx or lynx habitat are expected to be greater than those described under Alternatives 1 or 2 but are still expected to be long-term, localized, and minor in scale. Based on

the above assumptions and conclusions, Alternative 3 “may affect, but is not likely to adversely affect” Canada lynx.

Grizzly Bear

Direct and indirect effects to grizzly bears resulting from Alternative 3 would include those resulting from road use and maintenance, as described under Alternative 1. The presence and ongoing maintenance of existing park roads within or adjacent to bear habitat adversely affects grizzly bears, both directly and indirectly. Direct effects include permanent loss of habitat caused by paving of roads and pullouts and the potential for vehicle-caused mortality. Indirect effects from road use and maintenance would include a reduction in habitat effectiveness within the 1,312-ft (400-m) ZOI.

A reduction in habitat effectiveness could potentially result in slightly lower reproductive fitness of some individual bears within home ranges adjacent to the road corridor. However, range and population increases of grizzly bears in Grand Teton National Park suggest that impacts associated with existing roads have not yet reached a threshold impact level that jeopardizes the survival of grizzly bears in the Park. Other indirect effects to grizzly bears include human-caused displacement of bears from areas adjacent to roads, habituation to humans, and possibly other behavior modifications.

In addition to the effects resulting from existing conditions, Alternative 3 includes the construction of approximately 23.3 miles (37.3 km) of multi-use pathways and 15.5 miles (25.0 km) of improved road shoulders along the main park roads, which would have additional impacts. Direct impacts associated with these actions would include the permanent loss of approximately 63.8 (26.0 ha) of native vegetation (4.0 acres [1.6 ha] in the recovery zone) and an equal additional temporary loss during construction and revegetation phases (Tables 19 and 22). Most of this habitat alteration would occur immediately adjacent to existing roads (16.0 miles [26.0 km]) or within 50 ft (15.2 m) of the road (24.3 miles [38.3 km]). Additional indirect habitat loss within the 1,312-ft (400-m) ZOI associated with roads and multi-use pathways under this alternative would equal 4.4 acres (1.8 ha) within the grizzly recovery zone, and 135.6 acres (54.9 ha) (Appendix B, Table B-2) within the remainder of the project area (Figure 24).

By limiting actions to improved shoulder widening within the grizzly recovery zone, much of the habitat loss associated with this alternative would occur within the ZOI of existing roads. While several studies suggest bears tend to avoid road corridors (Mace et al. 1996, McLellan et al. 1988), in



Yellowstone and Grand Teton National Parks, where grizzly bear use of roadside habitats is tolerated, mounting evidence suggests these areas may be important to one or more individual bears annually (M. Haroldson 2006, pers. comm., S. Cain 2006, pers. comm.). In small areas where pathways would diverge as much as 150 ft (46 m) from roadsides (e.g., the Jenny Lake area), impacts would be increased. An increase in off-trail use associated with pathway access would further reduce habitat effectiveness by an unknown, but potentially moderate, amount at times. Indirect impacts associated with construction and use of the roadsides and multi-use pathways by more pedestrians and bicyclists would include human-caused displacement of bears from adjacent areas, potential habituation to humans (Herrero 1985), and possibly other behavior modifications. Mattson et al. (1992) reported that habituated bears in the GYA were killed from a variety of causes 3.1 times more often than wary bears. Use of the roadsides by more people would make it more difficult for most bears to habituate to this less predictable activity, however, and thus the loss in habitat effectiveness in the road's ZOI could be expected to be greater than under Alternatives 1 or 2.

The creation of non-motorized corridors, both expanded road shoulders and multi-use pathways, is expected to result in an increase in non-motorized use of these areas. Bear-human encounters in these areas would increase both because of increased human use and because of the added surprise factor that quiet, non-motorized use represents. This is particularly true where roads and pathways traverse habitats where terrain and/or vegetation limit sight distances, or where noise from streams can cover noise of approaching humans. Serious human injuries from such encounters may occur; however, their frequency cannot be predicted.

Adding pathways in grizzly bear habitat that are easily utilized by large numbers of the public (potentially carrying food) also creates additional opportunities for bears to become conditioned to human food (Herrero 1985). Experience in the Park has shown that food-storage regulation compliance is poorest and hardest to enforce among dispersed recreationists. Therefore, while education efforts would help mitigate this potential, some bears may become conditioned to human food. Bears that become conditioned to human food usually become a threat to human safety and ultimately need to be destroyed. Because Alternative 3 would have more pathways in grizzly bear habitat than Alternatives 1 or 2, it would result in higher potential for bear mortality associated with human food conditioning.

In this alternative, none of the proposed multi-use pathways occur within the grizzly bear recovery zone (USFWS 1993) or PCA identified in the final conservation strategy for the grizzly bear in the Yellowstone ecosystem (USFWS 2003). However, the approximately 5.5-mile (8.8-km) section of improved road shoulder proposed between Jackson Lake Junction and Colter Bay borders the PCA through willow, sage/grass, and mixed lodgepole, spruce-fir cover types where grizzly bears are common. The grizzly bear recovery zone was delineated to define an area within which to focus grizzly bear recovery efforts after the species was listed in 1975. At the time the boundary was delineated, grizzly bears were uncommon in Grand Teton National Park. Currently, however, grizzly bears are established in large areas outside of the PCA in Grand Teton National Park (Schwartz et al. 2002) (Figure 24), and the line has little relevance in terms of grizzly bear distribution.

The final conservation strategy for the grizzly bear in the Yellowstone ecosystem (USFWS 2003) was developed to guide grizzly bear management after the species is delisted. It includes a "no-net-loss" of secure habitat standard for all of the PCA. Thus, while the loss of secure habitat from expanded road shoulders and pathways, the ZOI from pathway and shoulder users, and off-trail use adjacent to the PCA would be technically allowable (considering the current distribution of bears), it would be contrary to the goals of the conservation strategy (considering the current distribution of bears), of which Grand Teton National Park is a signatory.

Currently, grizzly bears are uncommon in the area of proposed multi-use pathways on the Teton Park Road south of North Jenny Lake Junction. The probability of human-bear encounters in this area is further reduced because habitat cover types are predominately open with long sight distances. However, it is likely that grizzly bears would become more common in this area in the future. While grizzly bears are also currently uncommon along the Moose-Wilson Road corridor, individuals have been known to travel through the area. Realigning the roadway in this area is not anticipated to increase the probability of human-grizzly bear encounters and associated human injuries above the current level. Paving of social trails in and near campgrounds would perhaps help to keep visitors from straying into bear habitat, but otherwise would have no effect on bears.

Most of these adverse impacts would be considered minor; however, impacts from vehicle mortality could

be considered moderate because they could affect one or more bears but would not threaten the survival of the species.

Cumulative Impacts

Actions occurring on public lands within the recovery zone that would adversely affect grizzly bears or their habitat (i.e., oil and gas exploration and development, logging, and mining) are limited by the ESA (USFWS 1982) and are analyzed both individually and cumulatively via the NEPA compliance process. Other activities and issues likely to affect grizzly bears in the recovery zone include:

- Livestock grazing (which would impact grizzly bears through management actions).
- Private land development.
- Firewood cutting.
- Road use/management.
- Timber harvest (past).
- Recreation activities that leads to human-bear conflicts (especially big game hunting).
- Vegetation management.
- Wildland and prescribed fire.
- Loss or decline of important food sources (e.g., whitebark pine seeds due to fire suppression).
- Potential reduction in elk and bison populations.

These activities and issues cumulatively contribute to increased mortality risks, reduce availability of secure habitat, and diminish habitat effectiveness for grizzly bears. The total cumulative impact of the above-listed activities, as well as other unidentified actions occurring within the grizzly bear recovery zone, does not appear to be adversely affecting population recovery, as evidenced by the expanding grizzly bear population in the GYA (Eberhardt and Knight 1996, Schwartz et al. 2002, Pyare et al. 2004).

Cumulative impacts to grizzly bears in the GYA specific to this alternative would be similar to those under Alternatives 1 and 2 and include road kills, recreation use, management removals, and road or project construction. As previously noted two grizzly bears were killed by vehicles in Grand Teton National Park within the last two summer seasons. Since 1977 eighteen grizzly bears have been killed by vehicles in the GYA (M. Haroldson 2006, pers. comm.). Existing road conditions and grizzly bear distribution suggest that future road kills are likely. The cumulative

effects of these actual losses and possible future road kills are likely to be minor, however, because road kills are not a significant source of mortality to the population in the GYA.

Increases in backcountry recreation by humans in and around Grand Teton National Park may negatively affect grizzly bears if human-bear encounters increase. Elk hunting, as part of the Park's annual elk reduction, occurs in approximately 66,600 acres (26,952 ha) of the Park's backcountry, 29,100 acres (11,776 ha) of which are in the recovery zone or PCA. Hunting of elk and other big game also occurs outside of and adjacent to the Park's boundaries. Conflicts between grizzly bears and hunters appear to be increasing (Gunther et al. 2004), and these encounters are a potential source of bear mortality. In 2004 and 2005, seven of 19 (37 percent) and four of 14 (28 percent) human-caused grizzly bear mortalities in the Yellowstone ecosystem, respectively, were attributed to hunter conflicts (Haroldson and Frey 2006; M. Haroldson 2005, pers. comm.). In 2005, total human-caused mortality rates were under the mortality threshold; however, female mortalities exceeded the annual mortality threshold. 2005 was the second consecutive year that the female mortality threshold was exceeded (Haroldson and Frey 2006). Unless hunter-related conflicts increase substantially, the cumulative adverse effects of these conflicts at current grizzly bear population levels are likely to be minor. Land and wildlife management agencies, including Grand Teton National Park, have active programs designed to educate backcountry users about grizzly bears and the requirements designed to reduce human-bear conflicts.

Several privately owned and State of Wyoming-owned in-holdings are present in Grand Teton National Park. Depending upon future human activities occurring on these properties, grizzly bears would be negatively affected. For many years, Grand Teton National Park has attempted to secure these in-holdings with lifetime leases and outright purchases and has been quite successful in doing so. No large-scale developments or land-based projects have been proposed for these in-holdings. The LSR Preserve (approximately 1,100 acres [445 ha] in southern Grand Teton National Park) is being converted into an interpretive center and much of the existing development is being removed and reclaimed. In addition, management of this in-holding will eventually be handed over to Grand Teton National Park. Recently, efforts have been made by the federal government to secure several parcels of state-owned land within Grand Teton National Park. The cumulative adverse effects of possible future development occurring on these in-holdings are likely to be minor.



The recent Teton County, Wyoming approval of the Snake River Associates development plan for Teton Village on private land adjacent to the Park's south boundary could have additional cumulative, long term impacts on grizzly bears. This development will likely result in higher numbers of park visitors and associated dispersed use. This may be particularly true in the southwest corner of the Park, where excellent bear habitat exists. Grizzly bears will probably eventually colonize this area, even though it is several miles outside of the PCA.

In the past 20 years, two grizzly bears have been removed from Grand Teton National Park for management reasons: one for cattle depredation and one because of human habituation and food conditioning. The latter bear came to Grand Teton National Park as a nuisance bear after being relocated from the northern to the southern part of the ecosystem. An additional bear that had broken into a cabin at the AMK Ranch in Grand Teton National Park was killed after being relocated from Grand Teton National Park to Montana and continuing its nuisance behavior there. Management removals within the PCA and a 10-mile (16-km) buffer around it are counted against recovery parameters (USFWS 2003), mortality limits in the Conservation Strategy (USFWS 2003), and likely those associated with the delisting proposal (Schwartz et al. 2005). Implementation of this alternative would increase the potential for management removals, adding cumulatively to removals throughout the ecosystem.

In summary, losses of habitat effectiveness and potential lowering of reproductive fitness of some individual bears resulting from existing roads and approximately 16.0 miles (26.0 km) of expanded road shoulders and 24.3 miles (38.3 km) of new multi-use pathways would contribute only negligibly to cumulative impacts. Vehicle use of Grand Teton National Park roads, pedestrian and bicyclist use of proposed pathways, and potential management removals associated with this use are also expected to have minor cumulative impacts. Thus, overall, long-term cumulative impacts to grizzly bears in the GYA because of this alternative would be minor.

Mitigation Measures

- “Bearwise” education would be conducted with all personnel involved in road and pathway construction and maintenance projects.
- All food and other attractants would be properly stored at all times, and all food materials, garbage, and other attractants would be packed out on a daily basis if they cannot be stored in bear-resistant containers.

- All road-killed wildlife carcasses found less than 100 yards from the roadside would be removed within 24 hours to a location away from roads and human activities.
- Project crews (other than law enforcement personnel) would not carry firearms.
- Project crews would carry bear pepper spray when conducting project activities and would be trained in bear safety.
- All project crews working in grizzly bear habitat would meet standards for sanitation, attractant storage, and access.
- All grizzly bear/human confrontations would be reported to Science and Resource Management personnel.

Effects Determination and Summary of Rationale

Alternative 3 is not expected to have substantial adverse population level impacts on grizzly bears nor would it jeopardize the recovery of grizzly bears within the GYA. However, the inclusion of multi-use pathways and expanded road shoulders in grizzly bear habitat, some of which has limited sight distances, would reduce habitat effectiveness, increase potential for habituation and/or food conditioning by some bears, and increase potential for bear mortalities associated with management removals. It is also reasonable to expect that one or more grizzly bears could be struck and killed by vehicles using park roads during the lifetime of this Plan. Therefore, impacts to the Park and Greater Yellowstone grizzly bear population under Alternative 3 would be long-term, localized, and moderate since one or more individual bears “are likely to be adversely affected” by this alternative.

Gray Wolf

Direct and indirect effects to wolves resulting from Alternative 3 would include those resulting from road use and maintenance, as described under Alternative 1. The presence and ongoing maintenance of existing park roads within or adjacent to wolf habitat adversely affects wolves, both directly and indirectly. Direct effects include permanent loss of habitat caused by paving of roads and pullouts and the potential for vehicle-caused mortality. Radio-telemetry data have shown that the Teton and Sage packs regularly cross U.S. Highway 89/191 between Moran and Moose and between Moran and the Park's east boundary. Other wolves from unknown pack affiliations have also been observed crossing park roads on many occasions (S. Cain 2006, pers. comm.). Indirect effects from road use and maintenance

would include a reduction in habitat effectiveness within a ZOI beyond the boundaries of the habitat actually paved by the road. The loss of habitat associated with existing primary roads is estimated to be 14,577 acres (5,899 ha) (Appendix B, Table B-3). Other indirect effects to wolves include human-caused displacement from areas adjacent to roads, possible habituation to humans, and possibly other behavior modifications.

In addition to the effects resulting from existing conditions, Alternative 3 includes the construction of approximately 23.3 miles (37.3 km) of multi-use pathways and 15.5 miles (25.0 km) of improved shoulders along the main park roads, which would have additional impacts. Direct impacts associated with these actions would include the permanent loss of approximately 63.8 acres (25.8 ha) of habitat for wolves and some of their prey species (Tables 19 and 22) and an equal, additional temporary loss during construction and revegetation phases. Most of this habitat alteration would occur immediately adjacent to existing roads (15.5 miles [25.0 km]) or within 50 ft (15 m) of the road (23.3 miles [37.3 km]). Additional indirect habitat loss from extending the ZOI associated with roads and multi-use pathways under this alternative would equal a net loss of approximately 140.0 acres (56.7 ha) beyond the existing condition (Appendix B, Table B-2).

Because nearly all the habitat loss associated with this alternative would occur adjacent to or within ZOIs of existing roads, and because wolves and most of their primary prey tend to avoid road corridors, the loss in long-term habitat effectiveness would be minor. Indirect impacts associated with construction and use of the roadsides and multi-use pathways by more pedestrians and bicyclists would include human-caused displacement of wolves from adjacent areas, potential habituation to humans, and possibly other behavior modifications. An increase in off-trail use associated with pathway access would further reduce habitat effectiveness by an unknown but perhaps moderate amount at times. However, use of the roadsides and pathways by more people would make it more difficult for wolves and their prey to habituate to this less predictable activity along the corridor, and thus the loss in habitat effectiveness in the road's ZOI could be expected to be greater than under Alternatives 1 or 2. None of the proposed expanded road shoulders, multi-use pathways, or related construction activities would occur within 1 mile (1.6 km) of known wolf dens or rendezvous sites. Paving of social trails in and near campgrounds would have no effect on wolves.

Most of these adverse impacts would be considered minor; however, impacts from vehicle mortality could be considered moderate because they could affect one or more wolves but would not threaten the survival of the species. Between 1995 and 2001, 13 wolves were killed by vehicles in the GYA, and 3 wolves were killed within the Park during the last two years. Existing road conditions and future road reconstruction will likely result in the death of additional wolves, but will not threaten the survival of the species.

Cumulative Impacts

Activities occurring within wolf habitat that would adversely affect wolves in the GYA are limited and, for public land management agencies, are analyzed both individually and cumulatively via the NEPA compliance process. Other activities and issues likely to affect wolves occurring within the recovery zone include livestock grazing, private land development, vegetation management, potential reduction in elk and bison populations, and control actions.

These activities and others discussed under Alternative 1 cumulatively contribute to increased mortality risks and reduce the availability of secure habitat. However, the total cumulative impact of the above-listed activities, as well as other unidentified actions occurring within the wolf habitat, does not appear to have adversely affected population recovery, as evidenced by the quick expansion of the wolf population following reintroduction and the continued expansion into areas outside of YNP. Actions proposed under Alternative 3 could be expected to increase human presence within or improve access to wolf habitat that would cumulatively reduce habitat security in the long-term by a minor amount.

Impact Determination and Summary of Rationale

Alternative 3 is not expected to have substantial adverse population level impacts on wolves nor would it jeopardize the recovery of wolves within the GYA. However, habitat security would be reduced and it is reasonable to expect that one or more wolves could be struck and killed by vehicles using park roads during the lifetime of this Plan. Therefore, adverse impacts to the Park and Greater Yellowstone wolf populations under Alternative 3 would be long-term, localized, and moderate since one or more individual wolves are "likely to be adversely affected" by this alternative.



Yellow-billed Cuckoo

Similar to Alternatives 1 and 2, no direct adverse impacts to yellow-billed cuckoo would result from implementing Alternative 3. The proposed pathways, improved shoulders, and realignment of the Moose-Wilson Road would not occur near any known cuckoo nesting or foraging areas; however, approximately 2.4 acres (1.0 ha) of cottonwood riparian wetland and willow habitat that are potential cuckoo habitat would be potentially removed for the construction of multi-use pathways and roadway shoulder improvements (Appendix B). The direct impact from the loss of this habitat would be minor because the amount of habitat removed would be small.

Indirect impacts to cuckoos include displacement of individuals due to human presence and noise associated with project activities in areas that contain cuckoo habitat, such as near the Gros Ventre Bridge, Moose Bridge and Cottonwood Creek; however, no cuckoos have been reported in these areas. Any reduction in effective habitat from pathway and improved shoulder construction and increase in pedestrian and bicyclist use would be confined to the project's immediate area, as well as within the 246-ft (75-m) ZOI (see Alternative 1 for discussion on ZOIs for cuckoos). Under Alternative 3, approximately 8.0 acres (3.24 ha) of cottonwood, willow, and riparian wetland habitats would be potentially impacted within this ZOI beyond those impacted by the existing conditions. An increase in off-trail use associated with pathway access would further reduce habitat effectiveness by an unknown, but perhaps moderate, amount at times. The effects of human disturbance on cuckoos within the ZOI are unknown but may include displacement of individuals, changes in behavior, reduction in breeding and reproduction success, and movement to less desirable habitats. Although impacts during construction would be short term, repeated human disturbance from recreational use along the pathways and improved shoulders would be long term. Overall, adverse impacts from Alternative 3 would be long-term, localized, and minor, and greater than those from Alternatives 1 and 2.

Cumulative Impacts

Cumulative impacts to yellow-billed cuckoo associated with Alternative 3 would be greater than those identified in Alternatives 1 and 2 because additional habitat that would be used by cuckoos would be removed under this alternative. Loss of mature cottonwood forests and lack of recruitment have decreased suitable and future habitat for this species (MTPIF 2000). Fragmentation of cottonwood forests has resulted in many areas with patch

sizes below the recommended minimum. Any disturbance to yellow-billed cuckoo from pathway construction would contribute only negligibly to cumulative impacts. Vehicle use of Grand Teton National Park roads, and pedestrian and bicyclist use of proposed pathways, would contribute to cumulative impacts by a minor amount. Overall long-term cumulative impacts to yellow-billed cuckoo populations would be minor.

Impact Determination and Summary of Rationale

Under Alternative 3, individual yellow-billed cuckoos would be displaced by human presence, noise, and activities associated with pathway construction. Because the project area does not contain any known breeding or nesting cuckoos, these effects are expected to be minor. Actions proposed in this alternative could affect potential yellow-billed cuckoo nesting or foraging habitats. Overall, impacts to yellow-billed cuckoo populations under Alternative 3 are expected to be long-term, localized, and minor. Therefore, this alternative "may affect, but is not likely to adversely affect" the yellow-billed cuckoo.

Bird Species of Special Concern (Not Federally Listed) and Neotropical Migratory Birds

Neotropical Migratory Birds/ Bird Species of Special Concern

Direct and indirect effects to bird species of special concern and neotropical migratory birds resulting from Alternative 3 would be greater than those identified under Alternatives 1 and 2. Shoulder widening, road realignment, and pathway development would result in a direct loss of several different habitat types (Appendix B) and an estimated 5,200 to 7,100 trees would be removed (Table 17). The greatest amount of habitat loss would occur in shrubland/dwarf shrubland 35.3 acres (14.3 ha), conifer forest 2.0 acres (0.8 ha), and herbaceous vegetation 2.3 acres (0.9 ha) (Appendix B). The removal of these habitats would impact breeding, nesting, brood-rearing, and year-round foraging habitat of several bird species, such as sagebrush obligates, sagebrush near-obligates, forest bird dwellers (in particular those that use coniferous forests), and cottonwood or aspen forest-dependent birds. Nests, eggs, or young could be destroyed if construction of multi-use pathways and road shoulders occurs during the breeding season (mid-May through mid-July); therefore, mitigation measures to reduce these losses would be implemented.

Indirect impacts associated with the construction of road shoulders and pathways and their use by pedestrians and

bicyclists could cause a reduction in effective habitat within a 246-ft (75-m) ZOI (see Alternative 1 discussion on bird species of concern and neotropical migratory bird species ZOIs). A net increase of 259.0 acres (104.8 ha) of habitat could be impacted within this ZOI beyond the existing condition, including several different habitat types (Table 23), which would impact several bird species. An increase in off-trail use associated with pathway access would further reduce habitat effectiveness by an unknown but perhaps moderate amount at times. The indirect impacts to birds from human disturbance within the ZOI would be variable and difficult to quantify. Birds may respond to human use along a pathway in a variety of ways, and responses may differ depending upon an individual's species, age, sex, reproductive status, and habitat requirements. Responses from disturbances can range from nothing to displacement of individuals, modifications in behavior, and a reduction of reproductive success (Boyle and Samson 1985, Knight and Temple 1995, Miller et al. 1998). Additionally, species richness and abundance may change in areas with human disturbance. For example, avian predators have been shown to increase in areas of human intrusion resulting in a decline of songbird abundance and diversity (Martin 1988, Angelstam 1986, Buhler and Anderson 1999). Recreational disturbance to diurnal raptors may also disrupt behavior when it deters foraging or flushes birds from foraging perches and roosts (Holmes et al. 1993). Although individual disturbances may be brief in time, repeated encounters with recreationists could result in minor impacts to birds in the long term.

The construction of multi-use pathways along the Teton Park Road through contiguous conifer forests, sagebrush, willow and other habitats would alter bird species composition, distribution, and abundance. Studies have shown that some species of birds dependent upon contiguous habitat types may decline due to the creation of habitat edges and fragmentation from trails, whereas habitat generalists increase (Hickman 1990, Miller et al. 1998). Furthermore, nest predation from avian and mammalian predators (e.g., corvids and coyotes) and nest parasitism from brown-headed cowbirds typically increases in areas where habitat edges are created (Miller et al. 1998, Hickman 1990, Paton 1994). Although it is uncertain what effects habitat edges that are created under Alternative 3 would have on birds, it is expected that these effects would be long term and minor.

Impacts associated with Alternative 3 are expected to be variable; however, overall impacts to bird species of special concern and neotropical migratory birds would be long-

term, localized, minor, and adverse, and would be greater than under Alternatives 1 and 2.

Cumulative Impacts

Cumulative impacts to birds associated with Alternative 3 would be greater than those identified in Alternatives 1 and 2 due to the amount of habitat loss and fragmentation, the loss of habitat effectiveness, and the potential for human disturbance along the proposed pathway. A variety of habitat types used by birds would be removed from the construction of the pathway outside of the road corridor from the Park's south boundary to North Jenny Lake. The majority of this habitat would be sagebrush, thus bird species, such as sagebrush obligates and near-obligates, that use this habitat would be most impacted. Many of these species have shown range-wide declines due to habitat loss, fragmentation, increases in predation and parasitism, and other unknown factors. An increase in off-trail use associated with pathway access would further reduce habitat effectiveness and could increase habitat fragmentation. Any disturbances to birds from pathway construction and from vehicle, pedestrian, and bicyclist use of the proposed pathways would contribute a minor amount to cumulative impacts. Overall long-term cumulative impacts to bird species of special concern and/or other migratory bird populations would be long-term, localized, minor, and adverse.

Mitigation Measures

To minimize the potential for "taking" a nest or egg of a migratory bird species, either (1) any activity that would destroy a nest or egg would occur after July 15 (a timeframe outside of the primary nesting season), or (2) a survey for any nests in the project area would be conducted prior to these activities.

Greater Sage-Grouse

Direct impacts to sage-grouse resulting from Alternative 3 would primarily involve loss of habitat from the construction of multi-use pathways outside the road corridor and the improvement of road shoulders within the road corridor along U.S. Highway 26/89/191 and the Teton Park Road. Approximately 35.3 acres (14.3 ha) of potential sage-grouse habitat would be permanently removed outside the road corridor adjacent to U.S. Highway 26/89/191 between the southern park boundary and North Jenny Lake and within the road corridor from North Jenny to Signal Mountain. Because no known sage-grouse sightings have been reported along the Moose-Wilson Road, the NPS does not anticipate that the realignment actions in this area would impact sage-grouse.



Indirect impacts associated with the construction of road shoulders and pathways, and their use by pedestrians and bicyclists, include a reduction in habitat effectiveness within a ZOI (see Alternative 1 for discussion on sage-grouse ZOIs). An estimated net change of 62.7 acres (25.4 ha) of sagebrush habitat would be impacted within this ZOI, along the Teton Park Road from the south boundary to Signal Mountain (Appendix B) beyond the amount of sagebrush habitat impacted by existing conditions. Potential indirect effects to sage-grouse due to human presence and noise associated with project activities include displacement of individuals, habitat avoidance, and modifications in behavior. Human activity along roadways and dispersed use beyond the roadway could cause occasional flushing of birds from nests or brood-rearing areas. Although impacts during construction would be short term, repeated human disturbance from recreational use along improved shoulders would be long term.

The project area north of the Potholes does not contain critical sage-grouse habitat. Activities associated with paving social trails in and adjacent to campgrounds would not affect sage-grouse or their habitat.

Impacts associated with Alternative 3 would be greater than those in Alternatives 1 and 2. The loss of sagebrush habitat and its effectiveness in the ZOI, as well as the possible displacement of sage-grouse along the proposed pathway could result in be long-term, localized, and minor adverse effects to the greater sage-grouse.

Cumulative Impacts

Cumulative impacts to greater sage-grouse associated with Alternative 3 would be greater than those for Alternatives 1 and 2 because the amount of sagebrush removed under this alternative outside the road corridor along U.S. Highway 26/89/191 and the Teton Park Road would increase. Sage-grouse habitat management guidelines (Connelly et al. 2000) suggest protecting suitable breeding (nesting and early brood-rearing) habitats within 3.1 miles (5.0 km) from all occupied leks for non-migratory populations, such as the population residing in the Park. Research conducted in Grand Teton National Park, along with the tenuous nature of the sage-grouse population in Jackson Hole, led Holloran and Anderson (2004) to suggest that sagebrush should not be manipulated within 4.8 miles (7.7 km) of any known leks in the Park. Under Alternative 3, sagebrush would be removed along U.S. Highway 26/89/191 and the Teton Park Road between Moose and North Jenny Lake Junction from areas within a 4.8-mile (7.7 km) buffer near two active leks (the Airport and Timbered Island leks) and

would, therefore, potentially add to cumulative impacts to local sage-grouse populations.

Any disturbances to sage-grouse from pathway construction would contribute negligibly to cumulative impacts. Vehicle use of Grand Teton National Park roads, and pedestrian and bicyclist use of the proposed pathway, would contribute to cumulative impacts by a minor amount. Overall impacts to greater sage-grouse in the Jackson Hole population would be long-term, localized, minor, and adverse.

General Wildlife

Mammals

Direct and indirect adverse effects to mammals resulting from Alternative 3 would be similar to those described for Alternatives 1 and 2 (i.e., long-term, localized, and minor). In addition, Alternative 3 includes the construction of approximately 23.3 miles (37.3 km) of multi-use pathways and 15.5 miles (25.0 km) of improved road shoulders along the main park roads and paving /improvement of social trails near Jenny Lake and Signal Mountain. The road shoulder, road realignment, and multi-use pathway construction proposed under Alternative 3 would permanently remove approximately 63.8 acres (25.8 ha) (Table 19) of vegetation, mostly dry sagebrush shrubland but also some forested habitat. Most of this habitat loss would occur immediately adjacent to existing roads (15.5 miles [25.0 km]) or within 50 ft (15.2 m) of the road (23.3 miles [37.3 km]). Approximately, 3.1 acres (1.3 ha) (Table 19) of aspen habitat would be reclaimed following rerouting of a portion of the Moose-Wilson Road. Additional acres of vegetation would be temporarily disturbed by construction activities associated with improved roads and multi-use pathways. All disturbed areas outside of improved road and multi-use pathways surfaces (e.g., cut/fill slopes) would be reclaimed and revegetated with native vegetation. Finally, there would be some loss or disturbance to riparian vegetation and cottonwood communities where the proposed multi-use pathways cross the Snake River near Moose, the Gros Ventre River, and Cottonwood Creek along the Teton Park Road, and where shoulder widening occurs in the Willow Flats area and over Pilgrim Creek. This would be minimized by using existing bridges where possible. Paving social trails would not remove vegetation but could cause noise and disturbances that affect nearby wildlife.

Indirect habitat loss within the 1,312-ft (400-m) ZOI associated with roads and multi-use pathways under

this alternative would equal 140.0 acres (56.7 ha) (Table 23). Between North Jenny Lake Junction and Colter Bay, much of the habitat loss would occur within the ZOI of existing roads. In the short term, construction-related activity would likely temporarily displace any mammals present from habitat adjacent to the road; however, they would resume use in some areas once reclamation and revegetation activities are complete, depending upon their tolerance to human disturbance.

The construction of non-motorized corridors (both expanded shoulders and multi-use pathways) is expected to result in an increase in non-motorized recreation use in these areas and is likely to result in increased disturbance impacts and potential for wildlife-human conflicts compared to Alternative 2. Impacts to ungulates would be greatest where cover is poor and least where cover is greatest. Local use and movement by ungulates occurs daily throughout the summer and fall across the areas proposed for development of separated pathways, especially along the Moose-Wilson Road and the Teton Park Road near Windy Point, between Timbered Island and Signal Mountain. Daily ungulate movements also occur throughout the corridor between Jackson Lake Dam and Colter Bay. Movements of carnivores including black bears, coyotes, fox, etc. also occur throughout the project area. Where peak wildlife use of or movement through areas traversed by non-motorized routes coincide with high recreational activity, disturbance impacts are expected to be higher.

Existing and anticipated vehicle traffic levels on roads in Grand Teton National Park would be similar to Alternative 1 and would represent a minor potential source of mortality to mammals. There would be a small reduction in peak summer-vehicle traffic on the Teton Park Road as more visitors use the multi-use pathways, and this would have negligible beneficial effects on mammals by reducing the potential road kill threat. Signage would also be provided to warn motorists of wildlife crossing or high use areas. Although wildlife-vehicle collisions usually cause the death of an animal, the relative infrequency of these mortalities ensures that these impacts occur only at an individual level and do not adversely affect mammals at a population level.

Mitigation measures would be implemented to reduce impacts to wildlife habitat, including preservation of larger trees and snags, avoidance of nesting and denning seasons, and conducting wildlife surveys (as needed) to ensure that impacts are avoided or minimized. Overall, Alternative 3

would have long-term, localized, minor, adverse impacts to mammals.

Reptiles and Amphibians

Direct and indirect effects to amphibians and reptiles resulting from Alternative 3 would be greater than those identified under Alternative 1 and similar to those described from Alternative 2. Direct impact to amphibians and reptiles would primarily involve loss of habitat from the construction of multi-use pathways. Approximately 63.8 acres (25.8 ha) (Table 19) of habitat would be permanently removed, of which 1.4 acres (0.6 ha) would be wetland vegetation (Table 18). Other wetlands not removed, but within the project area, would be protected from construction activities to minimize erosion and siltation. Direct impacts from the removal of riparian wetland habitat would result in the direct loss of potential amphibian breeding habitat. The removal of other habitats (i.e., sagebrush, conifer forest, willow, and cottonwood) for pathway construction could also cause indirect impacts to amphibians or reptiles that use these areas to forage or for cover. Direct and indirect mortality of adult amphibians or reptiles due to human activities and pathway construction could also occur. Overall, impacts from Alternative 3 on reptiles and amphibians would be negligible to be short term, localized, and negligible to minor.

Cumulative Impacts (General Wildlife)

Cumulative impacts to wildlife under Alternative 3 would be generally the same as those identified in Alternative 1 (i.e., long-term, localized, minor to moderate, and adverse). The permanent loss of approximately 63.8 acres (25.8 ha) of native vegetation would contribute to cumulative impacts affecting wildlife that relies upon sagebrush and lodgepole pine plant communities, but to a small degree since these impacts would mostly occur within established road corridors. The permanent or temporary loss of a small portion of wetlands would contribute to cumulative impacts affecting wildlife, especially reptiles, but only negligibly. Wetland mitigation requirements would ultimately result in total replacement and a possible net increase in park wetlands that are similar in type and function to impacted wetlands. Human uses of linear facilities resulting from implementing Alternative 3, including vehicles that might kill wildlife, would contribute to cumulative impacts. In total, the contribution to wildlife cumulative impacts resulting from Alternative 3 is expected to be long-term, localized, minor to moderate, and adverse.



Conclusion (Threatened and Endangered (Federally Listed) Species, Bird Species of Special Concern, and General Wildlife)

Threatened and Endangered (Federally Listed) Species

Alternative 3 “may affect, but is not likely to adversely affect” the bald eagle, Canada lynx, or yellow-billed cuckoo. Alternative 3 is “likely to adversely affect” the grizzly bear and gray wolf because vehicle collisions or mortality related to human conditioning (for bears) would occur that would adversely affect one or more individuals; however, the alternative would not threaten the survival of either species.

Bird Species of Special Concern

Alternative 3 would have long-term, localized, minor, adverse effects on bird species of special concern, neotropical migratory birds, and the greater sage-grouse. Cumulative impacts would be long-term, minor, and adverse.

General Wildlife

Alternative 3 would have an intermediate level of adverse impacts on wildlife among the action alternatives considered. Although Alternative 3 is not expected to have adverse population level impacts on mammals, reptiles, and amphibians, there would be long-term, localized, negligible to moderate, adverse effects. The increased disturbance (both spatially and in terms of recreation use levels) would further fragment habitats and erode habitat effectiveness. These impacts would be greater than under Alternative 2 because of the additional disturbance related to multi-use pathways between the south boundary and Antelope Flats. The potential for human-wildlife conflicts and associated management actions would be higher than under Alternative 1 due to the addition of multi-use pathways, which affects a larger area and consequently a greater number of species and individuals. Direct mortality levels are not expected to increase under this alternative; however, it is likely that vehicles using park roads would continue to strike and kill individual mammals. Although no adverse population level impacts are anticipated, effects to local species distributions and habitat use patterns are likely. Cumulative impacts to general wildlife under this alternative would be long term, localized, minor to moderate, and adverse.

Because there would be no major, adverse impacts to wildlife resources or values, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park;

(2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park’s GMP or other relevant NPS planning documents, there would be no impairment of the Park’s wildlife resources, including any listed species or species of special concern, and no unacceptable impacts.

Effects of Alternative 3a — Preferred Alternative

Endangered and Threatened Species (Federally Listed Species)

Bald Eagle

No direct adverse impacts to bald eagles would result from implementing Alternative 3a. The proposed pathway would not directly affect bald eagle nesting, foraging, or wintering habitat. Construction of multi-use pathways would not occur within one-half mile (0.8 km) of known bald eagle nests. The development of multi-use pathways in the vicinity of the Snake River near Moose Bridge along Cottonwood Creek and Jackson Lake Dam would be confined to the existing roadway. The proposed pathway along the Moose-Wilson Road from the Granite Canyon Entrance Station to the LSR Preserve would not be constructed within bald eagle habitat.

Indirect effects from construction activities, pedestrians, and bicyclist use along pathways and vehicle road use would cause a reduction in habitat effectiveness within the ZOI (see Alternative 1 analysis for the definition of ZOIs for bald eagles). Disturbance from human presence, noise, and recreation along the pathways, and from dispersed use off pathways, could displace eagles or occasionally flush birds from perches in areas that contain suitable eagle habitat, such as near Moose Bridge, Cottonwood Creek, and at Jackson Lake Dam. Other indirect effects from human disturbance would include modifications of behavior, habitat avoidance, and possibly changes in reproductive success. Activities associated with construction would be short term; however, pedestrian and bicyclist use along pathways would be long term. Impacts from Alternative 3a would be greater than under Alternative 1 and similar to Alternatives 2 and 3. These impacts would have long-term, minor effects on bald eagles.

Cumulative Impacts

Cumulative impacts to bald eagles associated with Alternative 3a would be generally the same as those identified in Alternatives 1, 2, and 3. Any disturbances to bald eagles from pathway construction would contribute only negligibly to cumulative impacts. Vehicle use of Grand

Teton National Park roads and pedestrian and bicyclist use of proposed pathways would contribute to cumulative impacts by a minor amount. Overall long-term cumulative impacts to bald eagle populations would be minor.

Impact Determination and Summary of Rationale

Under Alternative 3a, individual bald eagles would be displaced by human presence, noise, and activities associated with pathway construction, but given that the project area is outside of bald eagle nest territories, these effects are expected to be localized and minor. No actions are proposed in this alternative that would directly affect important bald eagle wintering or foraging habitats. Overall, impacts to local and regional bald eagle populations under Alternative 3a are expected to be long-term, localized, and minor. Therefore, this alternative “may affect, but is not likely to adversely affect” bald eagles.

Canada Lynx

The types of direct and indirect effects to lynx resulting from Alternative 3a would be similar to those occurring under Alternative 1, 2, and 3, including direct mortality and direct and indirect impacts to lynx habitat. Overall impacts would be long-term minor and adverse.

In addition to effects resulting from existing conditions, Alternative 3a includes construction of approximately 22.5 miles (36.0 km) of multi-use pathways outside the road corridor between the south entrance and North Jenny Lake Junction and 15.5 miles (25.0 km) of multi-use pathways inside the road corridor along the Teton Park Road between North Jenny Lake Junction and Colter Bay and along 3.3 miles (5.3 km) of the Moose-Wilson Road. The Moose-Wilson Road would also be realigned in two locations.

The impacts associated with pathways south of North Jenny Lake Junction would be similar to those described under Alternative 3, with the following exceptions. Alternative 3a includes: 1) a multi-use pathway between the Granite Canyon Entrance Station and the LSR Preserve that would generally be constructed within the road corridor, 2) a section of pathway outside the road corridor between North Jenny Lake Junction and String Lake, and 3) a section of pathway outside the road corridor along Spring Gulch Road between Gros Ventre Junction and the Park boundary. Conifer habitats represent potential habitat for lynx. The two segments of roadway realignment and the multi-use pathway along the Moose-Wilson Road would result in a direct loss of 1.4 acres (0.6 ha) of conifer forest vegetation types (Appendix B, Table B-1). Constructing the pathway within the road corridor along the Moose-

Wilson Road would reduce impacts to lynx habitat by a small amount. Pathway construction in the other two segments would result in a direct loss of 5.9 acres (2.4 ha) of coniferous forest.

The addition of multi-use pathways inside the road corridor from North Jenny Lake Junction to Colter Bay would result in greater impacts to lynx habitat in comparison to Alternatives 1, 2 and 3. Disturbance impacts to lynx could occur from noise and human presence associated with construction and use of shoulders and pathways. All pathway segments proposed under this alternative (except the U.S. Highway 26/89/191 segment) traverse areas of relatively contiguous conifer habitat, which are mapped as lynx habitat. The width of existing linear corridors range from 18 to 30 ft (5.5 to 9.1 m). Pathway construction would increase corridor widths, including the area along the Moose-Wilson Road, to a maximum of 82 to 94 ft (25 to 28.65 m) (assuming pathway is 50 ft [15.2 m] from the road), with an attendant increase in the ZOI. The multi-use pathway would affect an additional 58.0 acres (23.0 ha) of coniferous forest habitat beyond the existing 400-m ZOI. Lynx are generally crepuscular animals and may rest in secure habitat during the day and emerge at night to use areas where human activity has stopped or decreased. Consequently, because pathway use would occur primarily during daylight hours, disturbance impacts to lynx habitats adjacent to the road and pathway corridors would be minimal.

Motor vehicle traffic levels under this alternative are expected to be similar to those predicted under the other alternatives and represent a negligible to minor potential source of mortality for lynx. The overall risk of direct mortality is not expected to increase from pathway construction and use.

Cumulative Impacts

Other activities occurring in the GYA that would affect lynx or their habitat include timber management, wildland fire management (including prescribed burns both inside and outside the Park), grazing (outside and inside the Park), winter recreation, and trapping of other furbearers. With the exception of trapping, all of these activities have the potential to affect forest successional stages, and consequently, snowshoe hare and lynx.

Cumulative impacts to Canada lynx associated with Alternative 3a would be generally the same as those identified in Alternatives 1, 2, and 3. Although road density would not increase under this alternative, the overall density of linear features would increase with an addition



of roughly 41.3 miles (66.3 km) of multi-use pathway inside and outside of the road corridor. The physical footprint of the road would increase slightly, and construction of the multi-use pathway would result in additional direct habitat loss and reduced habitat effectiveness. Disturbance to lynx from road realignment and pathway construction would represent a small contribution to cumulative impacts. Vehicle use of Grand Teton National Park roads, and pedestrian and bicyclist use of multi-use pathways, would contribute only minor cumulative impacts.

Effects Determination and Summary of Rationale

Under Alternative 3a, individual Canada lynx would be displaced by human presence and noise associated with routine maintenance and continued use of the transportation system. Even though Alternative 3a would result in the total loss of 7.1 acres (2.9 ha) of habitat; these losses would still be minor given the large amount of coniferous forest remaining within the project area that would not be impacted. No actions proposed in this alternative are likely to affect important lynx linkage areas. The likelihood of a lynx being struck and killed by a vehicle is anticipated to be low; lynx likely occur in the Park at low densities, if at all, and no vehicle mortalities have been reported to date. Impacts to lynx or lynx habitat are expected to be greater than those described under the other action alternatives but are still expected to be long-term, localized, and minor, but not adverse. Based on the above assumptions and conclusions, Alternative 3a “may affect, but is not likely to adversely affect” Canada lynx.

Grizzly Bear

Direct and indirect effects to grizzly bears resulting from Alternative 3a would include those resulting from road use and maintenance, as described under Alternative 1. The presence and ongoing maintenance of existing park roads within or adjacent to bear habitat adversely affects grizzly bears, both directly and indirectly. Direct effects include permanent loss of habitat caused by paving of roads and pullouts and the potential for vehicle-caused mortality. Indirect effects from road use and maintenance of existing primary roads would include a reduction in habitat effectiveness within the 1,312-ft (400-m) ZOI beyond the existing impacts (1,819 acres [735 ha]) within the designated recovery zone (Appendix B, Table B-3). The section of the Park road between North Jenny Lake Junction and Jackson Lake Junction is outside the grizzly bear recovery zone but is occupied by them. There would be a reduction of habitat within the 1,312-ft (400- m) ZOI of 31.5 acres (12.8 ha) within this segment of roadway associated with this alternative. A reduction in habitat

effectiveness could potentially result in slightly lower reproductive fitness of some individual bears within home ranges adjacent to the road corridor. However, range and population increases of grizzly bears in Grand Teton National Park suggest that impacts associated with roads have not yet reached a threshold impact level that jeopardize the survival of grizzly bears in the Park. Other indirect effects to grizzly bears include human-caused displacement of bears from areas adjacent to roads, habituation to humans, and possibly other behavior modifications.

In addition to the effects resulting from existing conditions, Alternative 3a includes the construction of approximately 41.3 miles (66.3 km) of multi-use pathways inside and outside of the roadway corridor and two areas of road realignment along the Moose-Wilson Road, which would have additional impacts. Throughout the project area, direct impacts associated with these proposed actions would include the permanent loss of approximately 83.0 acres (34.4 ha) of native vegetation (Tables 19 and 22) and an equal, additional temporary loss during construction and revegetation phases. Additional indirect habitat loss from extending the 1,312-ft (400-m) ZOI associated with roads and multi-use pathways under this alternative would equal 172 acres (70 ha) (Appendix B, Table B-2). The net change is estimated to be within the designated grizzly recovery zone and 146.2 acres (59.1 ha) (Appendix B, Table B-2) within the remainder of the Park. Direct and indirect vegetation loss adjacent to the grizzly bear recovery zone (from Jackson Lake Junction to Colter Bay) would be 9.7 acres (3.9 ha) and 19.7 acres (8.0 ha), respectively, while that in the remainder of currently occupied habitat (from North Jenny Lake Junction to Jackson Lake Junction) would be 15.2 acres (6.2 ha) and 31.5 acres (12.8 ha), respectively.

The addition of multi-use pathways within the road corridor from north Jenny Lake Junction to Colter Bay under Alternative 3a would result in higher impacts on grizzly bears because this area, in contrast to areas further south, supports a well-established population of grizzly bears. The proposed pathway passes through willow, sage/grass, and mixed lodgepole, spruce-fir cover types where grizzly bears are common. Beginning with Jackson Lake Junction and heading north, the pathway would occur immediately adjacent to the grizzly bear PCA (USFWS 2003). The PCA, or grizzly bear recovery zone as it was initially described (USFWS 1982), was delineated to define an area within which to focus grizzly bear recovery efforts after the species was listed in 1975. At the time the

boundary was delineated, grizzly bears were uncommon in Grand Teton National Park. Currently, however, grizzly bears are established in large areas outside of the PCA in Grand Teton National Park (Schwartz et al. 2002), and the line has little relevance in terms of grizzly bear distribution.

The impacts associated with pathways south of North Jenny Lake Junction along the Teton Park Road would be largely the same as in Alternative 3. Exceptions include 1) a multi-use pathway between the Granite Canyon Entrance Station and the LSR Preserve that would be built within the road corridor instead of outside of it, 2) a section of pathway outside the road corridor between North Jenny Lake Junction and String Lake, and 3) a section of pathway outside the road corridor between Gros Ventre Junction and the south boundary on Spring Gulch Road. Placing the pathway within the road corridor along the Moose-Wilson Road would reduce impacts on grizzly bears somewhat by keeping users and associated impacts closer to the road. It would also serve to increase sight distances in heavily vegetated areas, reducing the probability for dangerous bear-human encounters. On the other hand, adding a pathway outside of the road corridor between North Jenny Lake Junction and String Lake would increase impacts on grizzly bears. A short stretch of this alignment goes through grizzly bear habitat in a sparsely timbered area. Pathway construction and use in this area will extend the road corridor's ZOI and could result in an indirect loss of habitat. It would also increase the probability of dangerous bear-human encounters because of limited sight distances. Other parts of this alignment occur in sagebrush-grassland near known elk calving areas. As grizzly bears in the Park learn to search these areas for elk calves in the early summer, they could be displaced by pathway users. Finally, the pathway proposed between Gros Ventre Junction and the south boundary on Spring Gulch Road should have no impacts on grizzly bears because of the high level of human activity that already occurs in this area.

By maintaining multi-use pathways generally within 50 ft (15.2 m), of the road, much of the habitat loss associated with this alternative would occur adjacent to or within the existing roads' ZOI. While several studies suggest bears tend to avoid road corridors (e.g., Mace et al. 1996, McLellan et al. 1988), in Yellowstone and Grand Teton National Parks, where grizzly bear use of roadside habitats is tolerated, mounting evidence suggests these areas may be important to one or more individual bears annually (M. Haroldson 2006, pers. comm., S. Cain 2006, pers. comm.). In small areas where pathways diverge as much as 150 ft (45.72 m) from roadsides in the areas south of Jenny

Lake Junction, impacts would be increased. An increase in off-trail use associated with pathway access would further reduce habitat effectiveness by an unknown but perhaps moderate amount at times. Indirect impacts associated with construction and use of the multi-use pathways inside and outside of the roadway corridor by more pedestrians and bicyclists would include human-caused displacement of bears from adjacent areas, potential habituation to humans (Herrero 1985), and possibly other behavior modifications. However, use of the roadsides by more people would make it more difficult for bears to habituate to this less predictable activity; thus, the loss in habitat effectiveness in the roads' ZOI could be expected to be greater than under Alternatives 1, 2, or 3.

The creation of non-motorized corridors (i.e., multi-use pathways) is expected to result in an increase in non-motorized use of these areas. Bear-human encounters in these areas would increase because of increased human use and because of the added surprise factor that quiet, non-motorized use represents (see Pathways and Wildlife Hazards discussion). This is particularly true where roads and pathways traverse habitats where terrain and/or vegetation limit sight distances, or where noise from streams can cover noise of approaching humans. Serious human injuries from such encounters are likely to occur; however, their frequency cannot be predicted.

Adding pathways in grizzly bear habitat that are easily utilized by large numbers of the public (potentially carrying food) also creates additional opportunities for bears to become conditioned to human food (Herrero 1985). Experience in the Park has shown that food-storage regulation compliance is poorest and hardest to enforce among dispersed recreationists. Therefore, while education efforts would help mitigate this potential, some bears may become conditioned to human food. Bears that become conditioned to human food often become aggressive and ultimately need to be destroyed. Because this alternative would have more pathways in grizzly bear habitat than Alternatives 1, 2, or 3, it would represent a greater potential for bear mortality associated with human food conditioning.

In this alternative, none of the proposed pathways occur within the grizzly bear recovery zone (USFWS 1993) or PCA identified in the final conservation strategy for the grizzly bear in the Yellowstone ecosystem (USFWS 2003), assuming the pathway between Jackson Lake Junction and Colter Bay is built on the west side of U.S. Highway 89/191/287. However, this 5.5-mile (8.8-km) section of



pathway borders the PCA through willow, sage/grass, and mixed lodgepole, spruce-fir cover types where grizzly bears are common.

The final conservation strategy for the grizzly bear in the Yellowstone ecosystem (USFWS 2003) was developed to guide grizzly bear management after the species is delisted. It includes a “no-net-loss” of secure habitat standard for all of the PCA. Thus, while the loss of secure habitat from multi-use pathways adjacent to the PCA would be technically allowable, considering the current distribution of bears, it would be contrary to the conservation goals of the conservation strategy, of which Grand Teton National Park is a signatory.

Currently, grizzly bears are uncommon in the area of proposed multi-use pathways on the Teton Park Road south of North Jenny Lake Junction. The probability of human-bear encounters in this area is further reduced because habitat cover types are predominately open with long sight distances. However, it is likely that grizzly bears would become more common in this area in the future. While grizzly bears are also currently uncommon along the Moose-Wilson Road corridor, individuals have been known to travel through the area. Adding multi-use pathways in this area, along with varied terrain, heavy cover, and several noisy stream crossings, would escalate the probability of human-grizzly bear encounters and associated human injuries. Realigning portions of the roadway in this area is not anticipated to increase the probability of human-grizzly bear encounters and associated human injuries above the current level. Improving social trails in and near campgrounds would perhaps help to keep visitors from straying into bear habitat but otherwise would have no effect on bears.

Most of these adverse impacts would be considered minor; however, impacts from vehicle mortality and from potential mortality from human conditioning could be considered moderate because this could affect one or more individual bears. There is the potential for vehicle mortality and potential mortality from human conditioning could affect adult female bears, possibly effecting reproductive rates in the local population causing them to decrease. However, these impacts but would not threaten the survival of the species.

Cumulative Impacts

Actions occurring on public lands within the recovery zone that would adversely affect grizzly bears or their habitat (i.e., oil and gas exploration and development, logging, and mining) are limited by the ESA (USFWS 1982) and are

analyzed both individually and cumulatively via the NEPA compliance process. Other activities and issues likely to affect grizzly bears in the recovery zone include:

- Livestock grazing (which would impact grizzly bears through management actions).
- Private land development.
- Firewood cutting.
- Road use/management.
- Timber harvest (past).
- Recreation activities that leads to human-bear conflicts (especially big game hunting).
- Vegetation management.
- Wildland and prescribed fire.
- Loss or decline of important food sources (e.g., whitebark pine seeds due to fire suppression).
- Potential reduction in elk and bison populations.

These activities and issues cumulatively contribute to increased mortality risks, reduce availability of secure habitat, and diminish habitat effectiveness for grizzly bears. The total cumulative impact of the above-listed activities, as well as other unidentified actions occurring within the grizzly bear recovery zone, does not appear to be adversely affecting population recovery, as evidenced by the expanding grizzly bear population in the GYA (Eberhardt and Knight 1996; Schwartz et al. 2002; Pyare et al. 2004).

Cumulative impacts to grizzly bears in the GYA specific to this alternative would be similar to those under Alternatives 1, 2, and 3 and include road kills, recreation use, management removals, and road or project construction. Eighteen grizzly bears have been road-killed within the GYA since 1977 (Gunther et al. 2004, IGBST, unpublished data), including two in Grand Teton National Park within the last two years. The cumulative impacts of these actual losses and possible future road kills are likely to be minor because road kills are not a significant source of mortality to the population in the GYA.

Increases in backcountry recreation by humans in and around Grand Teton National Park would negatively affect grizzly bears if human-bear encounters increase. Elk hunting, as part of the Park’s annual elk reduction, occurs in approximately 66,600 acres (26,952 ha) of the Park’s backcountry, 29,100 acres (11,776 ha) of which are in the recovery zone or PCA. Hunting of elk and other

big game also occurs outside of and adjacent to the Park's boundaries. Conflicts between grizzly bears and hunters appear to be increasing (Gunther et al. 2004), and these encounters are a potential source of bear mortality. In 2004 and 2005, seven of 19 (37 percent) and four of 14 (28 percent) human-caused grizzly bear mortalities in the Yellowstone ecosystem, respectively, were attributed to hunter conflicts (M. Haroldson 2006, pers. comm.; M. Haroldson 2005, pers. comm.). In 2005, total human caused mortality rates were under the mortality threshold, but female mortalities exceeded the annual mortality threshold. This is the second consecutive year that the female mortality threshold has been exceeded (Haroldson and Frey 2006). However, unless hunter-related conflicts increase substantially, the cumulative adverse effects of these conflicts at current grizzly bear population levels are likely to be minor. Land and wildlife management agencies, including Grand Teton National Park, have active programs designed to educate backcountry users about grizzly bears and requirements designed to reduce human-bear conflicts.

Several privately owned and State of Wyoming owned in-holdings are present in Grand Teton National Park. Depending upon future human activities occurring on these properties, grizzly bears may be negatively affected. For many years, Grand Teton National Park has attempted to secure these in-holdings with lifetime leases and outright purchases and has been quite successful in doing so. No large-scale developments or land-based projects have been proposed for these in-holdings. The LSR Preserve (approximately 1,100 acres [445.2 ha] in southern Grand Teton National Park) will include an interpretive center, and much of the existing development has been removed and reclaimed. In addition, management of this in-holding eventually will be handed over to Grand Teton National Park. Recently, the federal government has made efforts to secure several parcels of state-owned land within Grand Teton National Park. The cumulative adverse effects of possible future development occurring on these in-holdings are likely to be minor.

The recent Teton County, Wyoming approval of the Snake River Associates development plan for Teton Village on private land adjacent to the Park's south boundary could have additional cumulative, long term impacts on grizzly bears. This development will likely result in higher numbers of park visitors and associated dispersed use. This may be particularly true in the southwest corner of the Park, where excellent bear habitat exists. It is likely that grizzly bears will eventually colonize this area, even though it is several miles outside of the PCA.

In the past 20 years, two grizzly bears have been removed from Grand Teton National Park for management reasons: one for cattle depredation and one because of human habituation and food conditioning. The latter bear came to Grand Teton National Park as a problem bear after being relocated from the northern to the southern part of the ecosystem. An additional bear that had broken into a cabin at the AMK Ranch in Grand Teton National Park was killed after being relocated from Grand Teton National Park to Montana and continuing its nuisance behavior there. Management removals within the PCA and a 10-mile (16-km) buffer around it are counted against recovery parameters (USFWS 2003) mortality limits in the Conservation Strategy (USFWS 2003), and likely those associated with the delisting proposal (Interagency Grizzly Bear Study Team 2005). Implementation of this alternative would increase the potential for management removals, adding cumulatively to removals throughout the ecosystem.

In summary, losses of habitat effectiveness, and potential lowering of reproductive fitness of some individual bears resulting from existing roads and approximately 41.3 miles (66.3 km) of new pathways, would have minor contributions to cumulative impacts. Vehicle use of Grand Teton National Park roads, pedestrian and bicyclist use of proposed pathways, and potential management removals associated with this use are expected to have minor cumulative impacts. Thus, overall long-term cumulative impacts to grizzly bears in the GYA because of this alternative would be minor.

Mitigation Measures

- "Bearwise" education would be conducted with all personnel involved in road and pathway construction and maintenance projects.
- All food and other attractants would be properly stored at all times, and all food materials, garbage, and other attractants would be packed out on a daily basis if they cannot be stored in bear-resistant containers.
- Project crews (other than law enforcement personnel) would not carry firearms.
- Project crews would carry bear pepper spray when conducting project activities and would be trained in bear safety.
- All project crews working in grizzly bear habitat would meet standards for sanitation, attractant storage, and access.
- All grizzly bear/human confrontations would be



reported to Science and Resource Management personnel.

Effects Determination and Summary of Rationale

Alternative 3a would have a higher level of adverse impacts than Alternatives 1, 2, or 3. The inclusion of multi-use pathways in grizzly bear habitat, much of which has limited sight distances, would result in loss of habitat effectiveness, a high potential for habituation and/or food conditioning by some bears, and bear mortalities associated with management removals. These activities are not expected to have adverse population level impacts on grizzly bears. However, management removals would contribute to cumulative mortalities in the ecosystem and could result in recovery delays. Removal of females would reduce the reproductive potential of grizzly bears locally, potentially resulting in a decrease in bear density. It is also reasonable to expect that one or more grizzly bears could be hit and killed by vehicles using park roads during the lifetime of this Plan. Therefore, impacts to the Park and Greater Yellowstone grizzly bear population under Alternative 3a would be long-term, localized, and moderate since one or more individual bears are “likely to be adversely affected” by this alternative.

Gray Wolf

Direct and indirect effects to wolves resulting from Alternative 3a would include those resulting from road use and maintenance, as described under Alternative 1. The presence and ongoing maintenance of existing park roads within or adjacent to wolf habitat adversely affects wolves, both directly and indirectly. Direct effects include permanent loss of habitat caused by paving of roads and pullouts and the potential for vehicle-caused mortality. Radio-telemetry data have shown that the Teton and Sage packs regularly cross U.S. Highway 89/191 between Moran and Moose and between Moran and the Park’s east boundary. Other wolves from unknown pack affiliations have also been observed crossing park roads on many occasions (S. Cain 2006, pers. comm.). Indirect effects from road use and maintenance would include a reduction in habitat effectiveness within the 1,312-ft (400-m) ZOI of the existing road, which is estimated to be 14,577.2 acres (5,899.2 ha) (Appendix B, Table B-3) beyond the boundaries of the habitat actually paved by the road. Other indirect effects to wolves include human-caused displacement from areas adjacent to roads, possible habituation to humans, and possibly other behavior modifications.

In addition to the effects resulting from existing conditions, Alternative 3a includes the construction of approximately

41.3 miles (66.3 km) of multi-use pathways and two areas of roadway realignment along the Moose-Wilson Road, which would have additional impacts. Direct impacts associated with the proposed actions would include the permanent loss of approximately 83 acres (34 ha) of habitat for wolves and some of their prey species (Tables 19 and 22) and an equal additional temporary loss during construction and revegetation phases. Additional indirect habitat loss would occur from the net loss of 171.2 acres (69.2 ha) of habitat within the 1,312-ft (400-m) ZOI (Appendix B, Table B-2).

Large portions of the wolf habitat loss associated with Alternative 3a would occur adjacent to or within the existing roads’ current ZOI. However, wolves and most of their primary prey tend to avoid road corridors, so the loss in long-term habitat effectiveness would be minor. Indirect impacts associated with construction and use of the roadsides and multi-use pathways by more pedestrians and bicyclists would include human-caused displacement of wolves from adjacent areas, potential habituation to humans, and possibly other behavior modifications. An increase in off-trail use associated with pathway access would further reduce habitat effectiveness by an unknown but perhaps moderate amount at times. Use of the pathways by more people would make it more difficult for wolves and their prey to habituate to this less predictable activity along the corridor as well; therefore, the total loss of habitat effectiveness in the pathways’ ZOI could be expected to be greater than under Alternatives 1, 2, or 3.

None of the proposed improved road shoulders, multi-use pathways, road realignment, or related construction activities would occur within 1 mile (1.6 km) of known wolf dens or rendezvous sites. If new dens or rendezvous sites were created within a mile of multi-use pathways, temporary pathway or adjacent area closures would be considered and implemented when necessary to protect breeding wolves. Improving social trails in and near campgrounds would have no effect on wolves.

Most of these adverse impacts would be considered minor; however, impacts from vehicle mortality could be considered moderate because this could affect one or more individual wolves but would not threaten the survival of the species. Between 1995 and 2001, 13 wolves were killed by vehicles in the GYA, and 3 wolves were killed within the Park between 2004 and 2005. Existing road conditions and future road reconstruction will likely result in the death of additional wolves.

Cumulative Impacts

Activities occurring within wolf habitat that would adversely affect wolves in the GYA are limited and, for public land management agencies, are analyzed both individually and cumulatively via the NEPA compliance process. Other activities and issues likely to affect wolves occurring within the recovery zone include livestock grazing, private land development, vegetation management, potential reduction in elk and bison populations, and control actions.

These activities cumulatively contribute to increased mortality risks and reduce the availability of secure habitat. However, the total cumulative impact of the above-listed activities, as well as other unidentified actions occurring within the wolf habitat, does not appear to have adversely affected population recovery, as evidenced by the quick expansion of the wolf population following reintroduction and the continued expansion into areas outside of YNP. The proposed actions, in the long term, could be expected to increase human presence within or improve access to wolf habitat by a minor amount that would cumulatively reduce habitat security.

Effects Determination and Summary of Rationale

Alternative 3a is not expected to have substantial adverse population level impacts on wolves nor would it jeopardize the recovery of wolves within the GYA. However, habitat security would be reduced, and it is reasonable to expect that one or more wolves could be struck and killed by vehicles using park roads during the lifetime of this Plan. Therefore, impacts to the Park and Greater Yellowstone wolf population under Alternative 3a would be long-term, localized, and moderate since one or more individual wolves are “likely to be adversely affected” by this alternative.

Yellow-billed Cuckoo

Similar to Alternatives 1, 2, and 3, no direct adverse impacts to yellow-billed cuckoo would result from implementing Alternative 3a. The proposed pathways along the Park’s roadways would not occur near any known cuckoo nesting or foraging areas; however, approximately 3.8 acres (1.5 ha) of cottonwood and riparian forests and willow habitat that are potential cuckoo habitat would be removed during construction of the pathway (Appendix B, Table B-2). Most of this direct loss would occur in the section of the project that is proposed along the Teton park road and Signal Mountain. The direct impact from removing this habitat would be minor because the amount removed would be small.

Indirect impacts to cuckoos include displacement of individuals due to human presence and noise associated with project activities in areas that contain cuckoo habitat, such as near the Moose Bridge, Gros Ventre Bridge, and Cottonwood Creek; however, no cuckoos have been reported in the project area. Reduction in effective habitat from pathway construction and increases in pedestrian and bicyclist use would be confined to the project’s immediate area, as well as within the 246-ft (75-m) ZOI (see Alternative 1 for discussion on ZOIs for cuckoos). Approximately 17 acres (6.9 ha) of cottonwood, riparian, and willow habitats would be within this 246-ft (75-m) ZOI under Alternative 3a (Appendix B). The effects human disturbance would have on cuckoos within the ZOI are unknown but would include displacement of individuals, changes in behavior, reduction in breeding and reproduction success, and movement to less desirable habitats. An increase in off-trail use associated with pathway access would further reduce habitat effectiveness by an unknown but perhaps moderate amount at times. Although impacts during construction would be short term, effects from repeated human disturbance from recreational use along the pathways would be long term. Overall, impacts from Alternative 3a would be long term, minor, and greater than those from Alternatives 1 and 2 but similar to Alternative 3.

Cumulative Impacts

Cumulative impacts to yellow-billed cuckoos associated with Alternative 3a would be greater than those identified in Alternatives 1 and 2 and similar to Alternative 3. Loss of mature cottonwood forests and lack of recruitment have decreased suitable and future habitat for this species. Fragmentation of cottonwood forests has resulted in many areas with patch sizes below the recommended minimum. Any disturbances to yellow-billed cuckoos during pathway construction would contribute to cumulative impacts by a minor amount. Vehicle use of Grand Teton National Park roads and pedestrian and bicyclist use of proposed pathways would contribute to cumulative impacts by a minor amount. Overall long-term, cumulative impacts to yellow-billed cuckoo populations would be long-term, minor, and adverse.

Impact Determination and Summary of Rationale

Under Alternative 3a, individual yellow-billed cuckoos would be displaced by human presence, noise, and activities associated with pathway construction. Because the project area does not contain any known breeding



or nesting cuckoos, these effects are expected to be minor. No actions are proposed in this alternative that would affect important yellow-billed cuckoo nesting or foraging habitats. Overall, impacts to yellow-billed cuckoo populations under Alternative 3a are expected to be long-term, localized, and minor. Therefore, this alternative “may affect, but is not likely to adversely affect” the yellow-billed cuckoo.

Bird Species of Special Concern (Not Federally Listed) and Neotropical Migratory Birds

Neotropical Migratory Birds/Birds Species of Special Concern

Direct and indirect effects to bird species of special concern and neotropical migratory birds resulting from Alternative 3a would be greater than those identified under Alternatives 1, 2, or 3. Direct impact to birds would primarily be the permanent loss of approximately 82.9 acres (33.5 ha) of habitat (Appendix B) and an estimated 17,900 to 23,075 trees would be removed (Table 20). Road realignment and pathway development would result in a direct loss of several different habitat types (Appendix B). The greatest amount of habitat loss would occur in sagebrush (52.5 acres [21.1 ha]), conifer forests (7.3 acres [3.0 ha]), and meadows (3.1 acres [1.3 ha]) (Appendix B, Table B-1). The removal of these habitats would impact breeding, nesting, brood-rearing, and year-round foraging habitat of several bird species, such as sagebrush obligates, sagebrush near-obligates, forest bird dwellers (in particular coniferous dwelling birds), and cottonwood or aspen forest-dependent birds. Nests, eggs, or young could experience impacts if construction of multi-use pathways occurs during the breeding season (mid-May through mid-July); therefore, mitigation measures to reduce these losses would be implemented. The amount of habitat removed under Alternative 3a would result in negligible to minor impacts to neotropical migratory birds and bird species of special concern.

Indirect impacts associated with the construction of multi-use pathways and their use by pedestrians and bicyclists could cause a reduction in effective habitat within a 246-ft (75-m) ZOI (see Alternative 1 discussion on bird species of concern and neotropical migratory bird species ZOIs). An estimated net loss of 181.9 acres (74.0 ha) of habitat could be impacted within this ZOI and in several different habitat types (Table 23). An increase in off-trail use associated with pathway access would further reduce habitat effectiveness by an unknown but perhaps moderate amount at times. The indirect impacts to birds from human disturbance

within the ZOI would be variable and difficult to quantify. Birds would respond to human use along a pathway in a variety of ways, and responses would differ depending upon an individual’s species, age, sex, reproductive status, and habitat requirements. Responses from disturbances can range from nothing to displacement of individuals, modifications in behavior, and a reduction of reproductive success (Boyle and Samson 1985, Knight and Temple 1995, Miller et al. 1998). Recreational disturbance to diurnal raptors may disrupt behavior when it deters foraging or flushes birds from foraging perches and roosts (Holmes et al. 1993). Recreational disturbance to diurnal raptors may also disrupt behavior when it deters foraging or flushes birds from foraging perches and roosts (Holmes et al. 1993). Additionally, species richness and abundance may change in areas adjacent to human disturbance. For example, avian predators have been shown to increase in areas of human intrusion resulting in a decline of songbird abundance and diversity (Martin 1988, Angelstam 1986, Buhler and Anderson 1999). Although individual disturbances would be brief, repeated encounters with recreationists could result in long-term and negligible effects to birds.

The construction of multi-use pathways along the Moose-Wilson Road and the Teton Park Road through contiguous conifer forests, sagebrush, and other habitats could also alter bird species composition, distribution, and abundance. Studies have shown that some species of birds dependent upon contiguous habitat types may decline due to the creation of habitat edges and fragmentation from trails, whereas habitat generalists increase (Hickman 1990; Miller et al. 1998). Furthermore, nest predation from avian and mammalian predators (e.g., corvids and coyotes) and nest parasitism from brown-headed cowbirds typically increases in areas where habitat edges are created (Miller et al. 1998, Hickman 1990, Paton 1994). Although it is uncertain what effects habitat edges created under Alternative 3a would have on birds, it is expected these effects would be long term and minor.

In general, impacts associated with Alternative 3a are expected to be variable; however overall impacts to bird species of special concern and neotropical migratory birds would be long term, localized, and minor. These impacts would be greater than those in Alternatives 1, 2, or 3.

Cumulative Impacts

Cumulative impacts to birds under Alternative 3a would be greater than those identified under Alternatives 1, 2, or 3, due to the amount of habitat loss and fragmentation, the loss of habitat effectiveness, and the potential for

human disturbance along the proposed pathway. A variety of habitat types used by birds would be removed from the construction of the pathway outside of the road corridor from the Park's south boundary to North Jenny Lake. The majority of this habitat would be sagebrush, thus bird species, such as sagebrush obligates and near-obligates, that use this habitat would be most impacted. Many of these species have shown range-wide declines due to habitat loss, fragmentation, increases in predation and parasitism, and other unknown factors. An increase in off-trail use associated with pathway access would further reduce habitat effectiveness and could increase habitat fragmentation. Disturbances to birds from pathway construction and vehicle, pedestrian, and bicyclist use of proposed pathways would contribute to cumulative impacts by a minor amount. Overall, impacts to bird species of special concern and/or other migratory bird populations would be long-term, localized, minor, and adverse.

Mitigation Measures

To minimize the potential for "taking" a nest or egg of a migratory bird species, either (1) any activity that would destroy a nest or egg would occur after July 15 (a timeframe outside of the primary nesting season), or (2) a survey for any nests in the project area would be conducted prior to these activities.

Greater Sage-Grouse

Direct impact to sage-grouse resulting from Alternative 3a would primarily involve loss of habitat from the construction of multi-use pathways along roadways and increased human use. Approximately 39.7 acres (16.0 ha) of sagebrush habitat would be permanently removed outside of the road corridor along U.S. Highway 26/89/191 between the southern park boundary North Jenny Lake Junction and within the road corridor from North Jenny Lake Junction and Signal Mountain (Appendix B) in areas where sage-grouse have been documented to nest, brood-rear, and winter (Holloran and Anderson 2004). Sage-grouse have not been reported using sagebrush habitats along the Moose-Wilson Road and the Teton Park Road north of North Jenny Lake Junction; therefore, removal of sagebrush along this section of the project would not directly impact sage-grouse.

Indirect impacts associated with the construction of road shoulders and pathways and their use by pedestrians and bicyclists include a reduction in habitat effectiveness within a ZOI (see Alternative 1 for discussion on sage-grouse ZOIs). An estimated 57.8 acres (29.8 ha) of sagebrush

habitat would be impacted within this ZOI, along the Teton Park Road from south park boundary to Signal Mountain (Appendix B), beyond what is impacted from existing conditions. Potential indirect effects to sage-grouse due to human presence and noise associated with project activities include displacement of individuals, habitat avoidance, and modifications in behavior. Human activity along roadways and dispersed use beyond the roadway could cause occasional flushing of birds from nests or brood-rearing areas. Although impacts during construction would be short term, repeated human disturbance from recreational use along pathways would be long term. As a result, impacts from Alternative 3a would have long-term, minor impacts to the greater sage-grouse.

Cumulative Impacts

Any disturbances to sage-grouse from pathway construction would contribute negligibly to cumulative impacts. Vehicle use of Grand Teton National Park roads, and pedestrian and bicyclist use of the proposed pathway, would contribute negligibly to cumulative impacts. Overall long-term cumulative impacts to greater sage-grouse in the Jackson Hole population would be negligible.

Cumulative impacts to greater sage-grouse associated with Alternative 3a would be greater than those identified in Alternatives 1 and 2 and similar to those from Alternative 3. Sage-grouse habitat management guidelines (Connelly et al. 2000) suggest protecting suitable breeding (nesting and early brood-rearing) habitats within 3.1 miles (5.0 km) from all occupied leks for non-migratory populations, such as the population residing in the Park. Based on research conducted in Grand Teton National Park, and due to the tenuous nature of the sage-grouse population in Jackson Hole, Holloran and Anderson (2004) suggest that sagebrush should not be manipulated within 4.7 miles (7.7 km) of any known leks in the Park. Alternative 3a would contribute to the loss of sagebrush habitat along U.S. Highway 26/89/191 and the inside Teton Park Road within a 4.7-mile (7.7-km) buffer from two active leks (the Airport and Timbered Island leks) and would therefore potentially add to cumulative impacts to local sage-grouse populations.

Any disturbances to sage-grouse from pathway construction would contribute negligibly to cumulative impacts. Vehicle use of Grand Teton National Park roads, and pedestrian and bicyclist use of the proposed pathway, would contribute negligibly to cumulative impacts. Overall long-term cumulative impacts to greater sage-grouse in the Jackson Hole population would be localized and negligible.



Impacts associated with Alternative 3a would be greater than those in Alternatives 1 and 2 and similar to Alternative 3. The loss of sagebrush habitat and its effectiveness in the ZOI, as well as the possible displacement of sage-grouse along the proposed pathway, could result in long-term, localized, minor, adverse effects to the greater sage-grouse.

General Wildlife

Mammals

Direct and indirect effects to mammals resulting from Alternative 3a would be similar to those described for the other action alternatives, but at a slightly higher impact level because of the additional pathways in sensitive areas. Road realignment and pathway construction would result in a direct loss of approximately 82.9 acres (45.5 ha) (Table 22) of native vegetation. Sagebrush and conifer forest habitats would mainly be affected, although some cottonwood, aspen, willow, and riparian habitats would also be impacted. Most of these impacts would be concentrated at or within approximately 50 ft (15 m) of previously disturbed areas along road corridors and within the most common plant communities. In addition, mitigation measures would be implemented to reduce impacts to wildlife habitat. These include preservation of larger trees and snags, avoidance of nesting and denning seasons, and conducting wildlife surveys (as needed) to ensure that impacts are avoided or minimized.

The impacts associated with pathways south of North Jenny Lake Junction would be similar to those described under Alternative 3, with the following exceptions. Alternative 3a includes: 1) a multi-use pathway between the Granite Canyon Entrance Station and the LSR Preserve that would generally be constructed within the road corridor, 2) a section of pathway outside the road corridor between North Jenny Lake Junction and String Lake, and 3) a section of pathway outside the road corridor along Spring Gulch Road between Gros Ventre Junction and the Park boundary. Placing the pathway inside the road corridor along the Moose-Wilson Road would reduce impacts to some extent (compared to Alternative 3) because activity would be concentrated in a narrower corridor through the productive wildlife habitats adjacent to the road. However, adding pathway segments between North Jenny Lake Junction and String Lake and Gros Ventre Junction and the Park boundary along Spring Gulch Road would increase impacts to mammals. Habitats adjacent to North Jenny Lake Junction to String Lake segment include sparse timber and mixed sagebrush-grasslands. Wildlife, especially elk make daily use of and movements through these habitats

and have calving areas nearby. Habitat effectiveness would be reduced along this segment. The Gros Ventre River corridor provides important wildlife habitat and serves as a travel corridor for a range of wildlife species. A pathway along this section would therefore increase impacts to mammals. Elk in particular make use of the area between the airport and the Gros Ventre River in moving between seasonal ranges (Wacob and Smith 2002). Habitat effectiveness may be reduced along this segment.

In the short term, construction-related activity could temporarily displace any mammals present from habitat adjacent to the road; however, they may resume use in some areas once reclamation and revegetation activities are complete, depending upon their tolerance to human disturbance. The construction of multi-use pathways both inside and outside of the roadway corridor is expected to result in an increase in non-motorized recreation use in these areas and is likely to result in increased disturbance impacts and potential for wildlife-human conflicts. Disturbance impacts to mammals are likely to be highest under this alternative because of the multi-use pathways being located both inside and outside of the road corridor resulting in the increase in the width of the linear corridor and its area of influence. Multi-use pathways would increase the 246-ft (75-m) and 1,312-ft (400-m) corridor ZOI by 180.9 acres (73.1 ha) and 171.5 acres (69.2 ha), respectively (Table 23). In addition, separation of the pathway from the road would encourage more users to stop (as a result of improved safety), leading to increased levels of disturbance and an increased potential for human-wildlife conflicts. Impacts to ungulates would be greatest where cover is poor and least where cover is greatest.

Existing and anticipated vehicle traffic levels on roads in Grand Teton National Park would be similar to Alternative 1 and would represent a minor potential source of mortality to mammals. There would be a small reduction in peak summer-vehicle traffic on the Teton Park Road as more visitors use the multi-use pathways, and this would have negligible beneficial effects on mammals by reducing the potential road kill threat. Signage would also be provided to warn motorists of wildlife crossing or high use areas. Although wildlife-vehicle collisions usually cause the death of an animal, the relative infrequency of these mortalities would ensure that these impacts occur only at an individual level and do not adversely affect mammals at a population level. Overall, Alternative 3a would have long-term, localized, minor, adverse impacts to mammals.

Reptiles and Amphibians

Direct and indirect effects to amphibians and reptiles resulting from Alternative 3a would be greater than those identified under Alternative 1 and similar to those described from Alternatives 2 and 3. Direct impact to amphibians and reptiles would primarily involve loss of habitat from the construction of multi-use pathways. Approximately 82.9 acres (45.5 ha) of habitat would be permanently removed, of which an estimated 5.3 acres (2.1 ha) would be riparian wetland (Table 18). Other wetlands not removed, but within the project area, would be protected from construction activities to minimize erosion and siltation. Direct impacts from the removal of riparian wetland habitat would result in the direct loss of potential amphibian breeding habitat. The removal of other habitats (i.e., sagebrush, conifer forest, willow, and cottonwood) for pathway construction could also cause indirect impacts to amphibians or reptiles that use these areas to forage or for cover. Direct and indirect mortality of adult amphibians or reptiles due to human activities and pathway construction could also occur. Overall, impacts to amphibians and reptiles from Alternative 3a would be short term, localized, negligible to minor, and adverse.

Cumulative Impacts (General Wildlife)

Cumulative impacts to general wildlife under Alternative 3a would be generally the same as those identified in Alternative 1 (i.e., long-term, localized, minor to moderate, and adverse). The permanent loss of approximately 82.9 acres (45.5 ha) (Table 22) of native vegetation would contribute to cumulative impacts affecting wildlife that relies upon sagebrush and coniferous forest plant communities. The permanent or temporary loss of a small portion of wetlands would contribute to cumulative impacts affecting wildlife, especially reptiles, but only negligibly. Wetland mitigation requirements would ultimately result in total replacement and a possible net increase in park wetlands that are similar in type and function to impacted wetlands. Direct mortality, habitat loss, and reduced habitat effectiveness associated with impacts from implementing Alternative 3a, would contribute to cumulative impacts, although the overall contribution is expected to be minor.

Conclusion (Threatened and Endangered (Federally Listed) Species, Bird Species of Special Concern, and General Wildlife)

Threatened and Endangered (Federally Listed) Species

Alternative 3a “may affect, but is not likely to adversely affect” the bald eagle, Canada lynx, or yellow-billed cuckoo. Alternative 3a is “likely to adversely affect” the grizzly bear and gray wolf because vehicle collisions or mortality related to human conditioning (for bears) may occur that would adversely affect one or more individuals; however, the alternative would not threaten the survival of either species.

Bird Species of Special Concern

Alternative 3a would have minor adverse effects on bird species of special concern, neotropical migratory birds, and the greater sage-grouse. Cumulative impacts would be long-term, localized, and minor.

General Wildlife

Alternative 3a would have a higher level of adverse impacts on wildlife than Alternatives 1, 2, and 3. Although direct habitat impacts on mammals, reptiles, and amphibians would be relatively small, the increased disturbance (both spatially and in terms of recreation use levels) would further fragment habitats and erode habitat effectiveness. These impacts would be greater than under Alternative 3 because of a greater area of impact caused by more linear feet of multi-use pathways both inside and outside of the roadway corridor are proposed. The addition of multi-use pathways, particularly along the Moose-Wilson corridor but also between Jackson Lake Junction and Colter Bay, would affect some of the Park’s most diverse and productive habitats. The potential for human-wildlife conflicts and associated management actions would be greater under this alternative than under Alternatives 1, 2, or 3 due to the larger area affected by the proposed pathways and the diverse habitats they traverse (i.e., greater number of species and individuals affected). Direct mortality levels are not expected to increase under this alternative; however, it is likely that vehicles using park roads would continue to strike and kill individual mammals. Although no adverse population level impacts are anticipated, effects to local species distributions and habitat use patterns are likely and would be negligible to moderate and adverse. Cumulative impacts to wildlife under this alternative would be long term, minor to moderate, and adverse.

Because there would be no major, adverse impacts to wildlife resources or values, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park’s GMP or other relevant



NPS planning documents, there would be no impairment of the Park's wildlife resources, including any listed species or species of special concern.

Effects of Alternative 4 — Multi-Use Pathways

Endangered and Threatened Species (Federally Listed Species)

Bald Eagle

No direct adverse impacts to bald eagles would result from implementing Alternative 4. The proposed pathway would not directly affect bald eagle nesting, foraging, or wintering habitat. Construction of multi-use pathways would not occur within one-half mile (0.8 km) of known bald eagle nests. The development of multi-use pathways in the vicinity of the Snake River near the Moose Bridge along Cottonwood Creek and Jackson Lake Dam would be confined to the existing roadway. The proposed pathway along the Moose-Wilson Road from the Granite Canyon Entrance Station to the LSR Preserve would not be constructed within bald eagle habitat.

Indirect effects from construction activities, pedestrians, and bicyclist use along pathways and vehicle road use would cause a reduction in habitat effectiveness within the ZOI (see Alternative 1 analysis for the definition of ZOIs for bald eagles). Disturbance from human presence, noise, and recreation along the pathways, and from dispersed use off pathways, could displace eagles or occasionally flush birds from perches in areas that contain suitable eagle habitat, such as near the Moose Bridge, Cottonwood Creek, and at Jackson Lake Dam. Other indirect effects from human disturbance would include modifications of behavior, habitat avoidance, and possibly changes in reproductive success. Activities associated with construction would be short term; however, pedestrian and bicyclist use along pathways would be long term. Impacts from Alternative 4 would be greater than under Alternatives 1 and 2, and similar to Alternatives 3 and 3a. These impacts would have long-term, minor effects on bald eagles.

Cumulative Impacts

Cumulative impacts to bald eagles associated with Alternative 4 would be generally the same as those identified in Alternatives 1, 2, 3, and 3a. Any disturbances to bald eagles from pathway construction would contribute only negligibly to cumulative impacts. Vehicle use of Grand Teton National Park roads and pedestrian and bicyclist use of proposed multi-use pathways would contribute to

cumulative impacts by a minor amount. Overall long-term cumulative impacts to bald eagle populations would be long-term, minor, and adverse.

Impact Determination and Summary of Rationale
Under Alternative 4, individual bald eagles would be displaced by human presence, noise, and activities associated with pathway construction, but given that the project area is outside of bald eagle nest territories, these effects are expected to be minor. No actions are proposed in this alternative that would directly affect important bald eagle wintering or foraging habitats. Overall, impacts to local and regional bald eagle populations under Alternative 4 are expected to be short-term, localized, and minor. Therefore, this alternative “may affect, but is not likely to adversely affect” bald eagles.

Canada Lynx

The types of direct and indirect effects to lynx resulting from Alternative 4 would be similar to those occurring under the other action alternatives, including direct mortality and direct and indirect impacts to lynx habitat. Overall impacts would be minor and adverse.

In addition to effects resulting from existing conditions, Alternative 4 includes construction of approximately 42.6 miles (68.4 km) of multi-use pathways outside the road corridor from the south boundary to Antelope Flats Road (a distance 9.4 miles [15.0 km]), from Moose Junction to Colter Bay (approximately 26.1 miles [42.0 km]), except for a section between Signal Mountain Lodge and Jackson Lake Dam where an improved road shoulder would be constructed, and from the Granite Canyon Entrance Station to Moose (a distance of approximately 7.1 miles [11.4 km]). There would also be a realignment of the Moose-Wilson Road in two locations associated with Alternative 4. Conifer habitats represent potential habitat for lynx. The two segments of roadway realignment along the Moose-Wilson Road and the installation of 7.1 miles (11.4 km) of multi-use pathway outside of the road corridor from the Granite Canyon Entrance Station to Moose would result in a direct loss of 3.9 acres (1.6 ha) of conifer forest vegetation types (Appendix B). An additional 11.6 acres (4.7 ha) of conifer forest would be lost due to construction of multi-use pathways outside of the road corridor through the remainder of the project area (Table 19).

Disturbance impacts to lynx could occur from noise and human presence associated with construction and use of shoulders and pathways. All pathway segments proposed under this alternative (except the U.S. Highway 26/89/191 segment) traverse areas of relatively contiguous conifer

habitat, which are mapped as lynx habitat. The width of existing linear corridors range from 18 to 30 ft (5.5 to 9.1 m). Pathway construction would increase corridor widths, including the area along the Moose-Wilson Road, to a maximum of 82 to 94 ft (25.0 to 28.7 m) (assuming pathway is 50 ft [15.2 m] from the road), with an attendant increase in the ZOI. The multi-use pathway would affect an additional 90.3 acres (36.5 ha) of coniferous forest habitat beyond the existing 400-m ZOI (Appendix B). Lynx are generally crepuscular animals and may rest in secure habitat during the day and emerge at night to use areas where human activity has stopped or decreased. Consequently, because pathway use would occur primarily during daylight hours, disturbance impacts to lynx habitats adjacent to the road and pathway corridors would be minimal.

Motor vehicle traffic levels under this alternative are expected to be similar to those predicted under the other alternatives and represent a minor potential source of mortality for lynx. The overall risk of direct mortality is not expected to increase from pathway construction and use.

Cumulative Impacts

Other activities occurring in the GYA that would affect lynx or their habitat include timber management, wildland fire management (including prescribed burns both inside and outside the Park), grazing (outside and inside the Park), winter recreation, and trapping of other furbearers. With the exception of trapping, all of these activities have the potential to affect forest successional stages, and consequently, snowshoe hare and lynx.

Cumulative impacts to Canada lynx associated with Alternative 4 would be generally the same as those identified in Alternatives 1, 2, 3, and 3a. Although road density would not increase under this alternative, the overall density of linear features would increase with an addition of roughly 42.6 miles (68.4 km) of multi-use pathway outside of the road corridor. The construction of the multi-use pathway would result in additional direct habitat loss and reduced habitat effectiveness. Disturbance to lynx from road realignment and pathway construction would represent a small contribution to cumulative impacts. Vehicle use of Grand Teton National Park roads, and pedestrian and bicyclist use of multi-use pathways, would contribute only minor cumulative impacts.

Effects Determination and Summary of Rationale

Under Alternative 4, individual Canada lynx would be displaced by human presence and noise associated

with routine maintenance and continued use of the transportation system. Of the action alternatives considered, direct loss of coniferous forest habitat would be greatest under Alternative 4; however, the total amount of habitat loss (15.5 acres [6.3 ha] total) would still be minor given the large amount of coniferous forest remaining that would not be impacted. The likelihood of a lynx being struck and killed by a vehicle is anticipated to be low; lynx likely occur in the Park at low densities, if at all, and no vehicle mortalities have been reported to date. Impacts to lynx or lynx habitat are expected to be greater than those described under the other action alternatives but are still expected to be long-term, localized, and minor. Based on the above assumptions and conclusions, Alternative 4 “may affect, but is not likely to adversely affect” Canada lynx.

Grizzly Bear

Direct and indirect effects to grizzly bears resulting from Alternative 4 would include those resulting from road use and maintenance, as described under Alternative 1. The presence and ongoing maintenance of existing park roads within or adjacent to bear habitat adversely affects grizzly bears, both directly and indirectly. Direct effects include permanent loss of habitat caused by paving of roads and pullouts and the potential for vehicle-caused mortality. Indirect effects from road use and maintenance would include a reduction in habitat effectiveness within the 1,312-ft (400-m) ZOI which is estimated to be approximately 1,819 acres (735 ha) within the grizzly bear PCA and recovery zone and 13,842 acres (5,593 ha) (Appendix B, Table B-3) within the remainder of the Park. The section of the Park road between North Jenny Lake Junction and Jackson Lake Junction is outside the grizzly bear recovery zone but is occupied by them. There would be a reduction of habitat within the 1,312-ft (400-m) ZOI of 44.8 acres (110.9 ha) within this segment of roadway associated with this alternative. A reduction in habitat effectiveness could potentially result in slightly lower reproductive fitness of some individual bears within home ranges adjacent to the road corridor. However, range and population increases of grizzly bears in Grand Teton National Park suggest that impacts associated with roads have not yet reached a threshold impact level that jeopardize the survival of grizzly bears in the Park. Other indirect effects to grizzly bears include human-caused displacement of bears from areas adjacent to roads, habituation to humans, and possibly other behavior modifications.



In addition to the effects resulting from existing conditions, Alternative 4 includes the construction of approximately 42.6 miles (68.4 km) of multi-use pathways outside of the roadway corridor and two areas of road realignment along the Moose-Wilson Road, which would have additional impacts. Throughout the project area, direct impacts associated with these proposed actions would include the permanent loss of approximately 85.1 acres (34.4 ha) of native vegetation (Tables 19 and 22) and an equal, additional temporary loss during construction and revegetation phases. Additional indirect habitat loss from extending the 400 m ZOI associated with roads and multi-use pathways under this alternative would equal 215.9 acres (87.4 ha) (Appendix B, Table B-2). Direct and indirect vegetation loss adjacent to the grizzly bear recovery zone (from Jackson Lake Junction to Colter Bay) would be 10.6 and 30.1 acres (26.2 and 74.5 ha) respectively, while that in the remainder of currently occupied habitat (from North Jenny Lake Junction to Jackson Lake Junction) would be 17.6 acres (43.6 ha) and 44.8 acres (110.9 ha), respectively.

The impacts associated with pathways between the south park entrance and North Jenny Lake Junction along the Teton Park Road would be largely the same as in Alternative 3 and 3a. Not including pathways between North Jenny Lake Junction and String Lake and between Gros Ventre Junction and the south boundary on Spring Gulch Road would lower impacts in those areas. However, there would be an increase in impacts associated with the road segment between North Jenny Lake Junction and Colter Bay caused by the pathway being located outside of the roadway corridor; as well as the installation of a multi-use pathway outside the road corridor along the entire segment of road between the Granite Canyon Entrance Station and Moose.

The addition of multi-use pathways outside of the road corridor from North Jenny Lake Junction to Colter Bay under Alternative 4 would result in higher impacts on grizzly bears because this area, in contrast to areas further south, supports a well-established population of grizzly bears. The proposed pathway passes through willow, sage/grass, and mixed lodgepole, spruce-fir cover types where grizzly bears are common. Beginning with Jackson Lake Junction and heading north, the pathway would occur immediately adjacent or within the grizzly bear PCA (USFWS 2003), assuming it would be placed on the west side of highway 89/191/287. The PCA, or grizzly bear recovery zone as it was initially described (USFWS 1982), was delineated to define an area within which to focus grizzly bear recovery efforts after the species was listed in 1975. At the time the boundary was delineated, grizzly

bears were uncommon in Grand Teton National Park. Currently, however, grizzly bears are established in large areas outside of the PCA in Grand Teton National Park (Schwartz et al. 2002), and the line has little relevance in terms of grizzly bear distribution.

Under Alternative 4 multi-use pathways in the area between North Jenny Lake and Colter Bay would be designed for placement along a route that accommodates a combination of design, safety, and expense concerns, but which would result in higher resource impacts. Maintaining the route within 50 ft of the road would be attempted wherever possible, but there would likely be several sections where the pathway would diverge from road as much as 150 ft (45.7 m). This would result in greater direct, indirect, and long term habitat loss than under the other alternatives. While several studies suggest bears tend to avoid road corridors (Mace et al. 1996, McLellan et al. 1988), in Yellowstone and Grand Teton National Parks, where grizzly bear use of roadside habitats is tolerated, mounting evidence suggests these areas may be important to one or more individual bears annually (M. Haroldson 2006, pers. comm., S. Cain 2006, pers. comm.). An increase in off-trail use associated with pathway access would further reduce habitat effectiveness by an unknown but perhaps moderate amount at times. Indirect impacts associated with construction and use of the multi-use pathways outside of the roadway corridor by more pedestrians and bicyclists would include human-caused displacement of bears from adjacent areas, potential habituation to humans (Herrero 1985), and possibly other behavior modifications. However, use of the roadsides by more people would make it more difficult for bears to habituate to this less predictable activity; thus, the loss in habitat effectiveness in the roads' ZOI could be expected to be greater than under Alternatives 1, 2, 3, or 3a.

The creation of non-motorized corridors (i.e., multi-use pathways) is expected to result in an increase in non-motorized use of these areas. Bear-human encounters in these areas may increase because of increased human use and because of the added surprise factor that quiet, non-motorized use represents (see Pathways and Wildlife Hazards discussion). This is particularly true where roads and pathways traverse habitats where terrain and/or vegetation limit sight distances, or where noise from streams can cover noise of approaching humans. Serious human injuries from such encounters are likely to occur; however, their frequency cannot be predicted.

Adding pathways in grizzly bear habitat that are easily utilized by large numbers of the public (potentially carrying food) also creates additional opportunities for bears to become conditioned to human food (Herrero 1985). Experience in the Park has shown that food-storage regulation compliance is poorest and hardest to enforce among dispersed recreationists. Therefore, while education efforts would help mitigate this potential, some bears would become conditioned to human food. Bears that become conditioned to human food often become aggressive and ultimately need to be destroyed. Because this alternative would have more pathways in grizzly bear habitat than any other alternative, it would represent the highest potential for bear mortality associated with human food conditioning.

In this alternative, none of the proposed separated pathways occur within the grizzly bear recovery zone (USFWS 1993) or PCA identified in the final conservation strategy for the grizzly bear in the Yellowstone ecosystem (USFWS 2003). However, the 5.5-mile (8.8-km) section of separated pathway proposed between Jackson Lake Junction and Colter Bay would border the PCA through willow, sage/grass, and mixed lodgepole, spruce-fir cover types where grizzly bears are common.

The final conservation strategy for the grizzly bear in the Yellowstone ecosystem (USFWS 2003) was developed to guide grizzly bear management after the species is delisted. It includes a “no-net-loss” of secure habitat standard for all of the PCA. Thus, while the loss of secure habitat from multi-use pathways adjacent to the PCA would be technically allowable, the areas that would potentially be impacted within the PCA and considering the current distribution of bears, implementation of this alternative, if location of segments of the multi-use pathways are within the PCA, would be contrary to the conservation goals of the conservation strategy, of which Grand Teton National Park is a signatory.

Currently, grizzly bears are uncommon in the area of proposed multi-use pathways on the Teton Park Road south of North Jenny Lake Junction. The probability of human-bear encounters in this area is further reduced because habitat cover types are predominately open with long sight distances. However, it is likely that grizzly bears would become more common in this area in the future. While grizzly bears are also currently uncommon along the Moose-Wilson Road corridor, individuals have been known to travel through the area. Adding multi-use pathways in this area, along with varied terrain, heavy

cover, and several noisy stream crossings, would escalate the probability of human-grizzly bear encounters and associated human injuries. Realigning the roadway in this area is not anticipated to increase the probability of human-grizzly bear encounters and associated human injuries above the current level. Improving social trails in and near campgrounds would perhaps help to keep visitors from straying into bear habitat but otherwise would have no effect on bears.

Most of these adverse impacts would be considered minor; however, impacts from vehicle mortality and from potential mortality from human conditioning could be considered moderate because this could affect one or more individual bears. In 2006, a radio-marked adult female grizzly (number 399) and her 3 cubs of the year used roadside habitats extensively in this area. If impacts from vehicle mortality and from potential mortality from human conditioning affected adult female bears, reproductive rates in the local population could decrease. However, these impacts would not threaten the survival of the species.

Cumulative Impacts

Actions occurring on public lands within the recovery zone that would adversely affect grizzly bears or their habitat (i.e., oil and gas exploration and development, logging, and mining) are limited by the ESA (USFWS 1982) and are analyzed both individually and cumulatively via the NEPA compliance process. Other activities and issues likely to affect grizzly bears in the recovery zone include:

- Livestock grazing (which would impact grizzly bears through management actions).
- Private land development.
- Firewood cutting.
- Road use/management.
- Timber harvest (past).
- Recreation activities that leads to human-bear conflicts (especially big game hunting).
- Vegetation management.
- Wildland and prescribed fire.
- Loss or decline of important food sources (e.g., whitebark pine seeds due to fire suppression).
- Potential reduction in elk and bison populations.

These activities and issues cumulatively contribute to increased mortality risks, reduce availability of secure



habitat, and diminish habitat effectiveness for grizzly bears. The total cumulative impact of the above-listed activities, as well as other unidentified actions occurring within the grizzly bear recovery zone, does not appear to be adversely affecting population recovery, as evidenced by the expanding grizzly bear population in the GYA (Eberhardt and Knight 1996; Schwartz et al. 2002; Pyare et al. 2004).

Cumulative impacts to grizzly bears in the GYA specific to this alternative would be similar to those under Alternatives 1, 2, 3 and 3a and include road kills, recreation use, management removals, and road or project construction. Eighteen grizzly bears have been road-killed within the GYA since 1977 (Gunther et al. 2004, IGBST, unpublished data), including two within Grand Teton National Park during the last two years. Thus, existing road conditions and grizzly bear distribution suggest that future road kills are likely. The cumulative impacts of these actual losses and possible future road kills are likely to be minor; however, because road kills are not a significant source of mortality to the population in the GYA.

Increases in backcountry recreation by humans in and around Grand Teton National Park would negatively affect grizzly bears if human-bear encounters increase. Elk hunting, as part of the Park's annual elk reduction, occurs in approximately 66,600 acres (26,952 ha) of the Park's backcountry, 29,100 acres (11,776 ha) of which are in the recovery zone or PCA. Hunting of elk and other big game also occurs outside of and adjacent to the Park's boundaries. Conflicts between grizzly bears and hunters appear to be increasing (Gunther et al. 2004), and these encounters are a potential source of bear mortality. In 2004 and 2005, seven of 19 (37 percent) and four of 14 (28 percent) human-caused grizzly bear mortalities in the Yellowstone ecosystem, respectively, were attributed to hunter conflicts (M. Haroldson 2006, pers. comm.; M. Haroldson 2005, pers. comm.). In 2005, total human caused mortality rates were under the mortality threshold, but female mortalities exceeded the annual mortality threshold. This was the second consecutive year that the female mortality threshold has been exceeded (Haroldson and Frey 2006). However, unless hunter-related conflicts increase substantially, the cumulative adverse effects of these conflicts at current grizzly bear population levels are likely to be minor. Land and wildlife management agencies, including Grand Teton National Park, have active programs designed to educate backcountry users about grizzly bears and requirements designed to reduce human-bear conflicts. Several privately owned and State of Wyoming-owned

in-holdings are present in Grand Teton National Park. Depending upon future human activities occurring on these properties, grizzly bears may be negatively affected. For many years, Grand Teton National Park has attempted to secure these in-holdings with lifetime leases and outright purchases and has been quite successful in doing so. No large-scale developments or land-based projects have been proposed for these in-holdings. The LSR Preserve (approximately 1,100 acres [445.2 ha] in southern Grand Teton National Park) will include an interpretive center, and much of the existing development has been removed and reclaimed. In addition, management of this in-holding eventually will be handed over to Grand Teton National Park. Recently, the federal government has made efforts to secure several parcels of state-owned land within Grand Teton National Park. The cumulative adverse effects of possible future development occurring on these in-holdings are likely to be minor.

The recent Teton County, Wyoming approval of the Snake River Associates development plan for Teton Village on private land adjacent to the Park's south boundary could have additional cumulative, long term impacts on grizzly bears. This development will likely result in higher numbers of park visitors and associated dispersed use. This may be particularly true in the southwest corner of the Park, where excellent bear habitat exists. Grizzly bears will probably eventually colonize this area, even though it is several miles outside of the PCA.

In the past 20 years, two grizzly bears have been removed from Grand Teton National Park for management reasons: one for cattle depredation and one because of human habituation and food conditioning. The latter bear came to Grand Teton National Park as a problem bear after being relocated from the northern to the southern part of the ecosystem. An additional bear that had broken into a cabin at the AMK Ranch in Grand Teton National Park was killed after being relocated from Grand Teton National Park to Montana and continuing its nuisance behavior there. Management removals within the PCA and a 10-mile (16-km) buffer around it are counted against recovery parameters (USFWS 2003), mortality limits in the Conservation Strategy (USFWS 2003), and likely those associated with the delisting proposal (Interagency Grizzly Bear Study Team 2005). Implementation of this alternative would increase the potential for management removals, adding cumulatively to removals throughout the ecosystem.

In summary, losses of habitat effectiveness, and potential lowering of reproductive fitness of some individual bears

resulting from existing roads and approximately 42.6 miles (68.2 km) of new pathways, would have minor contributions to cumulative impacts. Vehicle use of Grand Teton National Park roads, pedestrian and bicyclist use of proposed pathways, and potential management removals associated with this use are expected to have minor cumulative impacts. Thus, overall long-term cumulative impacts to grizzly bears in the GYA resulting from this alternative would be long-term, minor, and adverse.

Mitigation Measures

- “Bearwise” education would be conducted with all personnel involved in road and pathway construction and maintenance projects.
- All food and other attractants would be properly stored at all times, and all food materials, garbage, and other attractants would be packed out on a daily basis if they cannot be stored in bear-resistant containers.
- Project crews (other than law enforcement personnel) would not carry firearms.
- Project crews would carry bear pepper spray when conducting project activities and would be trained in bear safety.
- All project crews working in grizzly bear habitat would meet standards for sanitation, attractant storage, and access.
- All grizzly bear/human confrontations would be reported to Science and Resource Management personnel.

Effects Determination and Summary of Rationale

Alternative 4 would have the highest level of adverse impacts among the alternatives considered. The inclusion of multi-use pathways in grizzly bear habitat, much of which has limited sight distances, would result in loss of habitat effectiveness, a high potential for habituation and/or food conditioning by some bears, and bear mortalities associated with management removals. These activities are not expected to have adverse population level impacts on grizzly bears. However, management removals would contribute to cumulative mortalities in the ecosystem and could result in recovery delays. Removal of females would reduce the reproductive potential of grizzly bears locally, potentially resulting in a decrease in bear density. It is also reasonable to expect that one or more grizzly bears could be hit and killed by vehicles using park roads during the lifetime of this Plan. Therefore, impacts to the Park and Greater Yellowstone grizzly bear populations

under Alternative 4 would be long-term, localized, and moderate since one or more individual bears are “likely to be adversely affected” by this alternative.

Gray Wolf

Direct and indirect effects to wolves resulting from Alternative 4 would include those resulting from road use and maintenance, as described under Alternative 1. The presence and ongoing maintenance of existing park roads within or adjacent to wolf habitat adversely affects wolves, both directly and indirectly. Direct effects include permanent loss of habitat caused by paving of roads and pullouts and the potential for vehicle-caused mortality. Radio-telemetry data have shown that the Teton and Sage packs regularly cross U.S. Highway 89/191 between Moran and Moose and between Moran and the Park’s east boundary. Other wolves from unknown pack affiliations have also been observed crossing park roads on many occasions (S. Cain 2006, pers. comm.). Indirect effects from road use and maintenance would include a reduction in habitat effectiveness within the 1,312-ft (400-m) ZOI, which is estimated to be 14,577 acres (5,899 ha) (Appendix B, Table B-3) beyond the boundaries of the habitat actually paved by the road. Other indirect effects to wolves include human-caused displacement from areas adjacent to roads, possible habituation to humans, and possibly other behavior modifications.

In addition to the effects resulting from existing conditions, Alternative 4 includes the construction of approximately 42.6 miles (68.4 km) of multi-use pathways and two areas of roadway realignment along the Moose-Wilson Road, which would have additional impacts. Direct impacts associated with the proposed actions would include the permanent loss of approximately 85.1 acres (34.4 ha) of habitat for wolves and some of their prey species (Tables 19 and 22) and an equal additional temporary loss during construction and revegetation phases. Additional indirect habitat loss from extending the ZOI to 1,312 ft (400 m) under this alternative would result in a net difference of 215.9 acres (87.4 ha) (Appendix B, Table B-2).

Since much of the habitat loss associated with this alternative would occur adjacent to or within the existing roads’ current ZOI, and because wolves and most of their primary prey tend to avoid road corridors, the loss in long-term habitat effectiveness would be minor. Indirect impacts associated with construction and use of the multi-use pathways by more pedestrians and bicyclists would include human-caused displacement of wolves from adjacent areas, potential habituation to humans, and possibly



other behavior modifications. An increase in off-trail use associated with pathway access would further reduce habitat effectiveness by an unknown but perhaps moderate amount at times. Use of the pathways by more people would make it more difficult for wolves and their prey to habituate to this less predictable activity along the corridor as well; therefore, the total loss of habitat effectiveness in the pathways' ZOI could be expected to be greater than under any of the other alternatives.

None of the proposed multi-use pathways, road realignment, or related construction activities would occur within 1 mile (1.6 km) of known wolf dens or rendezvous sites. If new dens or rendezvous sites were created within a mile of multi-use pathways, temporary pathway or adjacent area closures would be considered and implemented when necessary to protect breeding wolves. Improving social trails in and near campgrounds would have no effect on wolves.

Most of these adverse impacts would be considered minor to moderate; however, impacts from vehicle mortality could be considered moderate because this could affect one or more individual wolves but would not threaten the survival of the species. Between 1995 and 2001, 13 wolves were killed by vehicles in the GYA, and 3 wolves were killed within the Park during 2004 and 2005. Existing road conditions and future road reconstruction will likely result in the death of additional wolves.

Cumulative Impacts

Activities occurring within wolf habitat that would adversely affect wolves in the GYA are limited and, for public land management agencies, are analyzed both individually and cumulatively via the NEPA compliance process. Other activities and issues likely to affect wolves occurring within the recovery zone include livestock grazing, private land development, vegetation management, potential reduction in elk and bison populations, and control actions.

These activities cumulatively contribute to increased mortality risks and reduce the availability of secure habitat. However, the total cumulative impact of the above-listed activities, as well as other unidentified actions occurring within the wolf habitat, does not appear to have adversely affected population recovery, as evidenced by the quick expansion of the wolf population following reintroduction and the continued expansion into areas outside of YNP. The proposed actions, in the long term, could be expected to increase human presence within or improve access to

wolf habitat by a minor amount that would cumulatively reduce habitat security.

Effects Determination and Summary of Rationale

Alternative 4 is not expected to have substantial adverse population level impacts on wolves nor would it jeopardize the recovery of wolves within the GYA. However, habitat security would be reduced, and it is reasonable to expect that one or more wolves could be struck and killed by vehicles using park roads during the lifetime of this Plan. Therefore, impacts to the Park and Greater Yellowstone wolf population under Alternative 4 would be long-term, localized, and moderate because one or more individual wolves are "likely to be adversely affected" by this alternative.

Yellow-billed Cuckoo

Similar to Alternatives 1, 2, 3, and 3a, no direct adverse impacts to yellow-billed cuckoo would result from implementing Alternative 4. The proposed pathways along the Park's roadways would not occur near any known cuckoo nesting or foraging areas; however, approximately 4.4 acres (1.8 ha) of cottonwood and riparian forests and willow habitats that are potential cuckoo habitat would be removed during construction of the multi-use pathways (Appendix B, Table B-1). Most of this direct loss would occur in the section of the project that is proposed along the Teton Park Road. The direct impact from removing this habitat would be minor because the amount removed would be small.

Indirect impacts to cuckoos include displacement of individuals due to human presence and noise associated with project activities in areas that contain cuckoo habitat, such as near the Moose Bridge and Cottonwood Creek; however, no cuckoos have been reported in the project area. Reduction in effective habitat from pathway construction and increases in pedestrian and bicyclist use would be confined to the project's immediate area, as well as within the 246-ft (75-m) ZOI (see Alternative 1 for discussion on ZOIs for cuckoos). Approximately 18.8 acres (7.6 ha) of cottonwood and riparian forests and willow habitats would be within this 246-ft (75-m) ZOI under Alternative 4 (Appendix B). The effects human disturbance would have on cuckoos within the ZOI are unknown but may include displacement of individuals, changes in behavior, reduction in breeding and reproduction success, and movement to less desirable habitats. An increase in off-trail use associated with pathway access would further reduce habitat effectiveness by an unknown but perhaps moderate amount at times. Although impacts

during construction would be short term, effects from repeated human disturbance from recreational use along the pathways would be long term. Overall, impacts from Alternative 4 would be long term, minor, and greater than those from Alternatives 1 and 2, but similar to Alternatives 3 and 3a.

Cumulative Impacts

Cumulative impacts to yellow-billed cuckoo associated with Alternative 4 would be greater than those identified in Alternatives 1 and 2 and similar to Alternative 3 and 3a. Loss of mature cottonwood forests and lack of recruitment have decreased suitable and future habitat for this species. Fragmentation of cottonwood forests has resulted in many areas with patch sizes below the recommended minimum. Any disturbances to yellow-billed cuckoos during pathway construction would contribute only negligibly to cumulative impacts. Vehicle use of Grand Teton National Park roads and pedestrian and bicyclist use of proposed pathways would contribute to cumulative impacts by a minor amount. Overall long-term, cumulative impacts to yellow-billed cuckoo populations would be minor.

Impact Determination and Summary of Rationale

Under Alternative 4, individual yellow-billed cuckoos would be displaced by human presence, noise, and activities associated with pathway construction. Because the project area does not contain any known breeding or nesting cuckoos, these effects are expected to be none. No actions are proposed in this alternative that would affect important yellow-billed cuckoo nesting or foraging habitats. Overall, impacts to yellow-billed cuckoo populations under Alternative 4 are expected to be long-term, localized, and minor. Therefore, this alternative “may affect, but is not likely to adversely affect” the yellow-billed cuckoo.

Bird Species of Special Concern (Not Federally Listed) and Neotropical Migratory Birds

Neotropical Migratory Birds/Birds Species of Special Concern

Direct and indirect effects to bird species of special concern and neotropical migratory birds resulting from Alternative 4 would be greater than those identified under Alternatives 1, 2, 3, or 3a. Direct impact to birds would primarily be the permanent loss of 85.1 acres (34.4 ha) of habitat (Appendix B) and an estimated 29,950 to 33,775 trees would be removed (Table 21). Road realignment and pathway development would result in a direct loss of several different habitat types (Appendix B). The greatest amount of

habitat loss would occur in sagebrush (55.7 acres [22.5 ha]) and conifer forest (15.1 acres [6.1 ha]), (Appendix B, Table B-1). The removal of these habitats would impact breeding, nesting, brood-rearing, and year-round foraging habitat of several bird species, such as sagebrush obligates, sagebrush near-obligates, forest bird dwellers (in particular those that use coniferous forests), and cottonwood or aspen forest-dependent birds. Nests, eggs, or young could experience impacts if construction of multi-use pathways occurs during the breeding season (mid-May through mid-July); therefore, mitigation measures to reduce these losses would be implemented. The amount of habitat removed under Alternative 4 would result in negligible to minor impacts to neotropical migratory birds and bird species of special concern.

Indirect impacts associated with the construction of multi-use pathways and their use by pedestrians and bicyclists could cause a reduction in effective habitat within a 246-ft (75-m) ZOI (see Alternative 1 discussion on bird species of concern and neotropical migratory bird species ZOIs). An estimated net loss of 226.5 acres (91.5 ha) of habitat could be impacted within this ZOI and in several different habitat types (Appendix B, Table B-2). An increase in off-trail use associated with pathway access would further reduce habitat effectiveness by an unknown but perhaps moderate amount at times. The indirect impacts to birds from human disturbance within the ZOI would be variable and difficult to quantify. Birds would respond to human use along a pathway in a variety of ways, and responses may differ depending upon an individual's species, age, sex, reproductive status, and habitat requirements. Responses from disturbances can range from nothing to displacement of individuals, modifications in behavior, and a reduction of reproductive success (Boyle and Samson 1985, Knight and Temple 1995, Miller et al. 1998). Recreational disturbance to diurnal raptors may disrupt behavior when it deters foraging or flushes birds from foraging perches and roosts (Holmes et al. 1993). Additionally, species richness and abundance may change in areas adjacent to the proposed pathway due to human disturbance. For example, avian predators have been shown to increase in areas of human intrusion resulting in a decline of songbird abundance and diversity (Martin 1988, Angelstam 1986, Buhler and Anderson 1999). Although individual disturbances may be brief, repeated encounters with recreationists could result in long-term and minor effects to birds.

The construction of multi-use pathways outside of the road corridor through contiguous conifer forests,



sagebrush, and other habitats could also alter bird species composition, distribution, and abundance. Studies have shown that some species of birds dependent upon contiguous habitat types may decline due to the creation of habitat edges and fragmentation from trails, whereas habitat generalists increase (Hickman 1990; Miller et al. 1998). Furthermore, nest predation from avian and mammalian predators (e.g., corvids and coyotes) and nest parasitism from brown-headed cowbirds typically increases in areas where habitat edges are created (Miller et al. 1998, Hickman 1990, Paton 1994). Although it is uncertain what effects habitat edges created under Alternative 4 would have on birds, it is expected these effects would be long term and minor.

In general, impacts associated with Alternative 4 are expected to be variable; however overall adverse impacts to bird species of special concern and neotropical migratory birds would be long term, localized, and minor. These impacts would be greater than those in Alternatives 1, 2, 3, and similar to Alternative 3a.

Cumulative Impacts

Cumulative impacts to birds under Alternative 4 would be greater than those identified under Alternatives 1 and 2, and similar to Alternatives 3 and 3a, due to the amount of habitat loss and fragmentation, the loss of habitat effectiveness, and the potential for human disturbance along the proposed pathway. An increase in off-trail use associated with pathway access would further reduce habitat effectiveness and could increase habitat fragmentation. Disturbances to birds from pathway construction and vehicle, pedestrian, and bicyclist use of proposed pathways would contribute to cumulative impacts by a minor amount. Overall, cumulative impacts to bird species of special concern and/or other migratory bird populations would be long-term, localized, minor, and adverse.

Mitigation Measures

To minimize the potential for “taking” a nest or egg of a migratory bird species, either (1) any activity that would destroy a nest or egg would occur after July 15 (a timeframe outside of the primary nesting season), or (2) a survey for any nests in the project area would be conducted prior to these activities.

Greater Sage-Grouse

Direct impact to sage-grouse resulting from Alternative 4 would primarily involve loss of habitat from the construction of multi-use pathways and increased human

use. Approximately 55.7 acres (22.5 ha) of sagebrush habitat would be permanently removed between the southern park boundary and Signal Mountain (Appendix B) in areas where sage-grouse have been documented to nest, brood-rear, and winter (Holloran and Anderson 2004). Sage-grouse have not been reported using sagebrush habitats along the Moose-Wilson Road and the Teton Park Road north of North Jenny Lake Junction; therefore, removal of sagebrush in these habitats would not directly impact sage-grouse.

Indirect impacts associated with the construction of road shoulders and pathways and their use by pedestrians and bicyclists include a reduction in habitat effectiveness within a ZOI (see Alternative 1 for discussion on sage-grouse ZOIs). An estimated 215.9 acres (87.2 ha) of sagebrush habitat would be impacted within this ZOI, along the Teton Park Road from south park boundary to North Jenny Lake Junction (Appendix B), beyond what is impacted from existing conditions. Potential indirect effects to sage-grouse due to human presence and noise associated with project activities include displacement of individuals, habitat avoidance, and modifications in behavior. Human activity along roadways and dispersed use beyond the roadway could cause occasional flushing of birds from nests or brood-rearing areas. Although impacts during construction would be short term, repeated human disturbance from recreational use along pathways would be long term. As a result, impacts from Alternative 4 would have long-term, minor, localized, adverse impacts to the greater sage-grouse.

Cumulative Impacts

Any disturbances to sage-grouse from pathway construction would contribute negligibly to cumulative impacts. Vehicle use of Grand Teton National Park roads, and pedestrian and bicyclist use of the proposed pathway, would contribute negligibly to cumulative impacts. Overall long-term cumulative impacts to greater sage-grouse in the Jackson Hole population would be long-term, localized, minor, and adverse.

Cumulative impacts to greater sage-grouse associated with Alternative 4 would be greater than those identified in Alternatives 1 and 2 and similar to those from Alternatives 3 and 3a. Sage-grouse habitat management guidelines (Connelly et al. 2000) suggest protecting suitable breeding (nesting and early brood-rearing) habitats within 3.1 miles (5 km) from all occupied leks for non-migratory populations, such as the population residing in the Park. Based on research conducted in Grand Teton National

Park, and due to the tenuous nature of the sage-grouse population in Jackson Hole, Holloran and Anderson (2004) suggest that sagebrush should not be manipulated within 4.7 miles (7.7 km) of any known leks in the Park. Alternative 4 would contribute to the loss of sagebrush habitat along U.S. Highway 26/89/191 and the inside Teton Park Road within a 4.7-mile (7.7-km) buffer from two active leks (the Airport and Timbered Island leks) and would therefore potentially add to cumulative impacts to local sage-grouse populations.

Impacts associated with Alternative 4 would be greater than those in Alternatives 1 and 2 and similar to Alternative 3 and 3a. The loss of sagebrush habitat and its effectiveness in the ZOI, as well as the possible displacement of sage-grouse along the proposed pathway, could result in long-term, localized, minor, adverse effects to the greater sage-grouse.

General Wildlife

Mammals

Direct and indirect effects to mammals resulting from Alternative 4 would be similar to those described for other action alternatives, but at a slightly higher impact level because of the additional pathways in sensitive areas. Road realignment and multi-use pathway construction outside of the roadway corridor would result in a direct loss of approximately 85.1 acres (34.4 ha) (Table 19) of native vegetation. Sagebrush and conifer forest habitats would mainly be affected, although some cottonwood, aspen, willow, and riparian habitats would also be impacted.

Although these vegetative impacts translate into habitat loss to some species of mammals, some of these impacts associated with the construction of the multi-use pathways would occur within the most common plant communities. In addition, mitigation measures would be implemented to reduce impacts to wildlife habitat. These include preservation of larger trees and snags, avoidance of nesting and denning seasons, and conducting wildlife surveys (as needed) to ensure that impacts are avoided or minimized.

In the short term, construction-related activity could temporarily displace any mammals present from habitat adjacent to the road; however, they may resume use in some areas once reclamation and revegetation activities are complete, depending upon their tolerance to human disturbance. The construction of multi-use pathways both inside and outside of the roadway corridor is expected to result in an increase in non-motorized recreation use in these areas and is likely to result in increased disturbance

impacts and potential for wildlife-human conflicts. Disturbance impacts to mammals are likely to be highest under this alternative because of the multi-use pathways being located both inside and outside of the road corridor resulting in the increase in the width of the linear corridor and its area of influence. Multi-use pathways would increase the net difference between the existing 246-ft (75-m) and 1,312-ft (400-m) corridor ZOI and those associated with the proposed actions in Alternative 4 by 226.5 acres (91.7 ha) and 215.9 acres (87.4 ha), respectively (Appendix B). In addition, separation of the pathway from the road would encourage more users to stop (as a result of improved safety), leading to increased levels of disturbance and an increased potential for human-wildlife conflicts. Impacts to ungulates would be greatest where cover is poor and least where cover is greatest.

Existing and anticipated vehicle traffic levels on roads in Grand Teton National Park would be similar to Alternative 1 and would represent a minor potential source of mortality to mammals. There would be a small reduction in peak summer-vehicle traffic on the Teton Park Road as more visitors use the multi-use pathways, and this would have negligible beneficial effects on mammals by reducing the potential road kill threat. Signage would also be provided to warn motorists of wildlife crossing or high use areas. Although wildlife-vehicle collisions usually cause the death of an animal, the relative infrequency of these mortalities would ensure that these impacts occur only at an individual level and do not adversely affect mammals at a population level. Overall, Alternative 4 would have long-term, localized, minor, adverse impacts to mammals.

Reptiles and Amphibians

Direct and indirect effects to amphibians and reptiles resulting from Alternative 4 would be greater than those identified under Alternative 1 and similar to those described from Alternatives 2, 3, and 3a. Direct impact to amphibians and reptiles would primarily involve loss of habitat from the construction of multi-use pathways. Approximately 85.1 acres (34.4 ha) (Table 19) of habitat would be permanently removed, of which an estimated 4.3 acres (1.7 ha) would be riparian wetland (Tables 18). Other wetlands not removed, but within the project area, would be protected from construction activities to minimize erosion and siltation. Direct impacts from the removal of riparian wetland habitat would result in the direct loss of potential amphibian breeding habitat. The removal of other habitats (i.e., sagebrush, conifer forest, willow, and cottonwood) for pathway construction could also cause indirect impacts to amphibians or reptiles



that use these areas to forage or for cover. Direct and indirect mortality of adult amphibians or reptiles due to human activities and pathway construction could also occur. Overall, impacts to amphibians and reptiles from Alternative 4 would be short term, localized, negligible to minor, and adverse.

Cumulative Impacts (General Wildlife)

Cumulative impacts to general wildlife under Alternative 4 would be generally the same as those identified in Alternative 1 (i.e., long-term, minor to moderate, and adverse). The permanent loss of approximately 85.1 acres (34.4 ha) (Table 19) of native vegetation would contribute to cumulative impacts affecting wildlife that relies upon sagebrush and coniferous forest plant communities. The permanent or temporary loss of a small portion of wetlands would contribute to cumulative impacts affecting wildlife, especially reptiles, but only negligibly. Wetland mitigation requirements would ultimately result in total replacement and a possible net increase in park wetlands that are similar in type and function to impacted wetlands. Direct mortality, habitat loss, and reduced habitat effectiveness associated with impacts from implementing Alternative 4, would contribute to cumulative impacts, although the overall contribution is expected to be long-term, localized, minor, and adverse.

Conclusion (Threatened and Endangered (Federally Listed) Species, Bird Species of Special Concern, and General Wildlife)

Threatened and Endangered (Federally Listed) Species

Alternative 4 “may affect, but is not likely to adversely affect” the bald eagle, Canada lynx, or yellow-billed cuckoo. Alternative 4 is “likely to adversely affect” the grizzly bear and gray wolf because vehicle collisions may occur that would adversely affect one or more individuals; however, the alternative would not threaten the survival of either species.

Bird Species of Special Concern

Alternative 4 would have long-term, minor, adverse effects on bird species of special concern, neotropical migratory birds, and the greater sage-grouse. Cumulative impacts would be long-term, minor, and adverse.

General Wildlife

Alternative 4 would have the highest level of adverse impacts on wildlife of the alternatives considered. Although direct habitat impacts on mammals, reptiles,

and amphibians would be relatively small, the increased disturbance (both spatially and in terms of recreation use levels) would further fragment habitats and erode habitat effectiveness. These impacts would be greater than any other alternative considered because of a greater area of impact caused by more linear feet of multi-use pathways outside of the roadway corridor. The addition of multi-use pathways outside of the roadway corridor, particularly along the Moose-Wilson corridor but also between Jackson Lake Junction and Colter Bay, would affect some of the Park’s most diverse and productive habitats. The potential for human-wildlife conflicts and associated management actions would be greatest under this alternative due to the larger area affected by the proposed pathways and the diverse habitats they traverse (i.e., greater number of species and individuals affected). Direct mortality levels are not expected to increase under this alternative; however, it is likely that vehicles using park roads would continue to strike and kill individual mammals. Although no adverse population level impacts are anticipated, effects to local species distributions and habitat use patterns are likely and would be localized, negligible to moderate and adverse. Cumulative impacts to wildlife under this alternative would be localized, long term, minor to moderate, and adverse.

Because there would be no major, adverse impacts to wildlife resources or values, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park’s GMP or other relevant NPS planning documents, there would be no impairment of the Park’s wildlife resources, including any listed species or species of special concern, and no unacceptable impacts.

Cultural Resources

Methods and Assumptions

Section 106 of the NHPA requires a federal agency to take into account the effects of its undertakings on properties included in, eligible for inclusion in, or potentially eligible for inclusion in the NRHP, and afford the following a reasonable opportunity to comment on such undertakings: the SHPO, affiliated American Indian Tribes and, as appropriate, the ACHP, individuals and organizations with a demonstrated interest in the undertaking, and the general public.

In accordance with the ACHP’s regulations implementing Section 106 of the NHPA (36 CFR Part 800, Protection of Historic Properties), impacts to cultural resources were identified and evaluated by (1) determining the area of potential effects (APEs); (2) identifying cultural resources present in the APE that are either listed in or eligible to be listed in the NRHP (categorized as “historic properties”); (3) applying the criteria of adverse effects to affected historic properties; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

Under the ACHP’s regulations, a determination of either “adverse effect” or “no adverse effect” is made for affected historic properties. An “adverse effect” occurs whenever an impact alters, directly or indirectly, any characteristic of a property that qualifies it for inclusion in the NRHP (i.e., diminishing the integrity of the resource’s location, design, setting, materials, workmanship, feeling, or association). Adverse effects also include reasonably foreseeable effects that would occur later in time, be farther removed in

distance, or be cumulative (36 CFR Part 800.5, Assessment of Adverse Effects). A determination of “no adverse effect” means that the property would be affected; however, the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the NRHP.

CEQ regulations and Director’s Order #12, Conservation Planning, Environmental Impact Analysis and Decision Making, also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact (i.e., reducing the intensity of an impact from major to moderate or minor). Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect, as defined by Section 106, is similarly reduced. Although adverse effects under Section 106 would be mitigated, the effect remains adverse.

| Impact Threshold Definitions | |
|-------------------------------------|---|
| Negligible | Impact at the lowest levels of detection; barely measurable, with no perceptible consequences. For purposes of Section 106 of the NHPA, the determination of effect would be no historic properties affected. |
| Minor | Adverse impact - Disturbance of a site(s) results in little, if any, loss of integrity. The determination of effect for Section 106 would be no adverse effect. |
| | Beneficial impact - Maintenance and preservation of a site(s). The determination of effect for Section 106 would be no historic properties affected |
| Moderate | Adverse impact - Disturbance of a site(s) results in loss of integrity. Section 106-effect determination would be adverse effect. A Memorandum of Agreement (MOA) is executed among the NPS and applicable state or tribal historic preservation officer and, if necessary, the ACHP in accordance with 36 CFR 800.6(b). Measures identified in the MOA to minimize or mitigate adverse impacts reduce the intensity of impact under NEPA from major to moderate. |
| | Beneficial impact - Stabilization of a site(s). The determination of effect for Section 106 would be no historic properties affected. |
| Major | Adverse impact - Disturbance of a site(s) results in loss of integrity. The determination of effect for Section 106 would be adverse effect. Measures to minimize or mitigate adverse impacts cannot be agreed upon and the NPS and applicable state or tribal historic preservation officer and/or ACHP are unable to negotiate and execute an MOA in accordance with 36 CFR 800.6(b). |
| | Beneficial impact - Active intervention to preserve a site(s). The determination of effect for Section 106 would be no historic properties affected |
| Duration | Short term — Recovers in less than 3 years. |
| | Long term — Takes more than 3 years to recover. |
| Area of Analysis | Within park boundary. |



Archeological Resources

Direct impacts to archeological resources are measured by the extent of physical disturbance or degradation of the resource. This can occur because of grading, trenching, or other activities that damage the structure of an archeological site. Indirect impacts can occur because of increasing visitor activity or management action in the immediate vicinity, leading to unfortunate consequences (i.e., artifact collection, accelerated soil compaction, and erosion).

Proposed roadway shoulder, pathway, and other improvements were located on a base sheet provided by park staff that identified known archeological resources and the completeness and adequacy of related survey data. It should be noted that this analysis considers only known archeological sites. Additional field survey work is required before construction to identify additional sites, as well as their data potential and potential for inclusion in the NRHP.

Impacts to archeological resources are considered permanent unless otherwise noted. Every effort would be made to avoid historic properties (i.e., those archeological site listed on or considered eligible for listing in the NRHP) through careful project design and subsequent site-specific environmental compliance. If sites cannot be avoided, all data recovery to retrieve important information would be done in consultation with the Wyoming SHPO and in accordance with the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (SGAHP).

Effects of Alternative 1 — No Action

Under Alternative 1, no new road improvements would occur, and impacts to archeological resources would be attributable to future increases in visitation or continued road maintenance. As noted previously, it is assumed that visitation would increase only slightly over the life of this Final Plan/EIS. Expected types of impacts include the erosion of vegetative cover and soil layers in heavily traveled areas and exposure of new artifacts and features to potential loss through theft or destruction before they can be documented by staff. Areas of highest intensity of use with known resources include South Jenny Lake, Jenny Lake Lodge, String/Leigh Lake, the Moose area, and Taggart Lake. Areas of road improvements would include repair of existing pavement and possible widening, as needed. Construction of separate entrance lanes and installation of improved signage for pedestrian and wildlife safety and two variable messaging signs would occur on

existing disturbed grounds and would not result in new net disturbance; therefore, there would be no impacts to archeological resources.

Because archeological survey work has not been completed in many segments, or has not been completed in accordance with SGAHP, the data potential for such resources is unknown, and thus it is difficult to estimate the intensity of impacts. Because visitation is expected to grow relatively slowly during the period, and road improvements would be conducted in areas that have already been disturbed during the initial construction of the road, impacts would be long-term, localized, negligible to minor, and adverse, depending on the number of resources affected in a given area and their data potential. Known sites would be avoided, and archeological surveys would be conducted in those areas where impacts are anticipated.

Cumulative Impacts

Recent, current, and planned projects within Grand Teton National Park that would affect archeological resources include rehabilitation and adaptive use of the Murie Ranch, construction of a new visitor center at Moose, replacement of the Moose Entrance Station, construction of an interpretive center for the LSR Preserve, upgrades to the Jenny Lake Lodge visitor accommodations and employee housing facilities, reconstruction and widening of North Park Road between Lizard Creek Campground and the South Entrance of Yellowstone, replacement of the Snake River Bridge near Flagg Ranch, and the chip-and-seal project from Moran to Jackson Lake Lodge. Widening of North Park Road would take place within an existing road corridor within the Park. In addition, WYDOT is planning reconstruction of U.S. Highway 26/287 (Togwotee Pass), U.S. Highway 26/89 from Hoback Junction to South Park, Wyoming Highway 22 from Jackson to Wilson, and Wyoming Highway 390 (Teton Village Road).

All of these developments would occur in areas where human activities are already concentrated, thus minimizing the likelihood that previously unknown archeological resources would be disturbed. Of these projects, the Moose Visitor Center is the only project that would be expected to impact previously recorded archeological sites in the area due to increased ground disturbance related to construction. A surface survey of the proposed site located three historic pits of unknown use or origin, one foundation, two abandoned two-track roads, and isolated areas of historic debris (none in high concentrations). No proposed facilities would be located in areas where these resources have been found. Should additional resources

be discovered during construction, they would be properly documented and evaluated for NRHP eligibility. The impacts of these related actions, in conjunction with the impacts of Alternative 1, would result in long-term, localized, negligible to minor, cumulative impacts to archeological resources within the Park.

Conclusion

Alternative 1 would result in long-term, localized, negligible to minor, adverse impacts on known archeological sites located within the Park, depending on the number of resources affected and their data potential. Because many areas where resources are known to exist have either not been surveyed or have not been surveyed in accordance with SGAHP, additional research, fieldwork, and consultation with the Wyoming SHPO and Native American tribal governments would be needed to determine whether these sites are eligible for listing in the NRHP. Should the sites be considered eligible for listing in the NRHP, consultation with the Wyoming SHPO and Native American governments would be required to make a determination of “no adverse effect” or “adverse effect,” in compliance with Section 106 of the NHPA. Cumulative impacts would be long term, localized, negligible to minor, and adverse.

Because there would be no major, adverse impacts to an archeological resource or value, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park’s GMP or other relevant NPS planning documents, there would be no impairment of the Park’s archeological resources and no unacceptable impacts.

Effects of Alternative 2 — Improved Road Shoulders

Alternative 2 proposes limited shoulder improvement (widening to 5 ft [1.5 m]) from Moose Junction to Signal Mountain Lodge. The small amount of disturbance (13.3 acres [5.4 ha]) resulting from the construction of the shoulder would be limited to the areas immediately adjacent to the existing roadway. Field surveys would need to be carried out in these areas before any ground-disturbing activities occur. Should sites be found, the NPS would undertake required consultations with the Wyoming SHPO and Native American governments to determine whether the project constitutes a “no adverse effect” or “adverse effect.” If adverse, a mitigation plan would be developed, again in consultation with the Wyoming SHPO and affiliated tribal governments.

Information kiosks would be added to South Jenny Lake, Signal Mountain Lodge, Jackson Lake Lodge, and Colter Bay as part of this alternative. To avoid impacts to archeological resources, these facilities would be sited in locations without known resources. Because known archeological resources would be avoided wherever possible, potential long-term, localized impacts could range from negligible to minor depending on the number of resources affected and their data potential and would be adverse. Construction of separate entrance lanes and installation of improved signage for pedestrian and wildlife safety and additional variable messaging signs would have the same effects as those described for Alternative 1.

Cumulative Impacts

Current and planned projects within Grand Teton National Park that would affect archeological resources are similar to those described under Alternative 1. The impacts of these related actions, in conjunction with the specific impacts of Alternative 2, would result in long-term, negligible to minor, cumulative impacts to archeological resources within the Park.

Conclusion

Alternative 2 would result in potentially long-term, localized, negligible to minor, adverse impacts on known archeological sites located within the Park, depending on the number of resources affected and their data potential. Because many areas where resources are known to exist have either not been surveyed or have not been surveyed in accordance with SGAHP, additional research, fieldwork and consultation with the Wyoming SHPO and Native American tribal governments would be needed to determine whether these sites are eligible for listing in the NRHP. Should the sites be determined eligible for listing in the NRHP, the NPS would undertake required consultations with the Wyoming SHPO and Native American governments to make a determination of “no adverse effect” or “adverse effect.” Cumulative impacts would be long term, negligible to minor, and adverse.

Because there would be no major, adverse impacts to an archeological resource or value, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park’s GMP or other relevant NPS planning documents, there would be no impairment of the Park’s archeological resources and no unacceptable impacts.



Effects of Alternative 3 — Improved Road Shoulders / Multi-Use Pathways

Impacts to cultural resources under Alternative 3 would range from negligible to minor depending upon the chosen location. The majority of the area has not been surveyed for archeological resources, and a complete inventory would be conducted prior to construction activities to identify previously undocumented archeological, historic, ethnographic, and/or cultural landscape resources. If any are found, the Park staff would consult with the Wyoming SHPO regarding additional actions needed to protect cultural resources. Direct and indirect effects could be mitigated by diverting the pathway in such a way as to avoid archaeological and ethnographic resources.

Construction of multi-use pathways outside the road corridor along approximately 23.3 miles (37.3 km) of roads and improving road shoulders along the Teton Park Road and North Park Road between North Jenny Lake Junction and Colter Bay (15.5 miles [25.0 km]) would permanently disturb approximately 63.8 acres [25.8 ha], and cause temporary disturbance to approximately 63.8 additional acres (25.8 ha) where construction equipment would be used adjacent to the main work area.

From the south boundary to North Jenny Lake Junction effects to archeological resources from pathway construction outside the road corridor would be long term, localized, negligible to minor, and adverse. Ninety-seven acres have been surveyed along the roadway between Dornan's and South Jenny Lake; 12 archaeological sites were already known to exist in this area and four new sites were identified during the survey, most of which occur east of the existing road. Placing the pathway on the west side of the road would most likely have fewer impacts to cultural resources than placing the pathway on the east side, based on past survey results and predictive factors. The rest of this corridor would be surveyed before implementation.

The potential effects to archeological resources from improved shoulders from North Jenny Lake Junction to Colter Bay would be long term, localized, negligible, and adverse because construction would occur adjacent to the existing road. Both Jenny Lake and Colter Bay developed areas have been inventoried for cultural resources; however, the area between these two locations has not been inventoried. Known sites located on the west side of the road would be avoided and surveys of the rest of the area would occur before implementation.

Construction of a multi-use pathway outside the road corridor from the Granite Canyon Entrance Station to the LSR Preserve along the Moose-Wilson Road could require the removal of 2,925 to 3,725 trees, depending on the specific design. The areas around the Granite Canyon Entrance Station and Poker Flats have been inventoried. No other archeological surveys have been conducted in the areas along the Moose-Wilson Road. Two sites occur on the west side of the road. It is likely that placing the pathway on the east side of the road would have fewer impacts to cultural resources than placing it on the west, based on past survey results and predictive factors. An inventory of all locations would be conducted prior to any construction activity resulting in long-term, localized, negligible to minor, adverse effects.

The proposed road realignment passing to the east of the wetland area on the Moose-Wilson Road would have long-term, localized, negligible, adverse impacts if all disturbance remains within the footprint of a previous road alignment. The section of the Moose-Wilson Road that would be realigned to intersect with the Teton Park Road has been inventoried. The areas of the existing road where removal and restoration to natural conditions would take place are near archaeological sites, which would be protected during restoration activities.

Construction of separate entrance lanes and installation of improved signage for pedestrian and wildlife safety and additional variable messaging signs would have the same effects as those described for Alternative 1. As described for Alternative 2, installation of information kiosks would avoid impacts to archeological resources by siting these facilities in locations without known resources. Improving social trails would reduce the potential for impacts to unknown resources by decreasing the use of informal trails.

Cumulative Impacts

Current and planned projects within the Park that would affect archeological resources are similar to those described under Alternative 1. A combination of all past, present, and reasonably foreseeable future actions that could cause cumulative impacts would result in long-term, negligible to minor, adverse impacts, depending upon chosen location and what is yet to be identified through future cultural resource inventories. Adverse impacts to the majority of cultural resources should be avoided by diverting the pathways around site locations.

Conclusion

Alternative 3 would result in potentially long-term, localized, negligible to minor, adverse impacts on known archeological sites located within the Park, depending on the number of resources affected and their data potential. Because many areas where resources are known to exist have either not been surveyed or have not been surveyed in accordance with SGAHP, additional research, fieldwork and consultation with the Wyoming SHPO and Native American tribal governments would be needed to determine whether these sites are eligible for listing in the NRHP. Should the sites be determined eligible for listing in the NRHP, the NPS would undertake required consultations with the Wyoming SHPO and Native American governments to make a determination of “no adverse effect” or “adverse effect.” Cumulative impacts would be long term, negligible to minor, and adverse.

Because there would be no major, adverse impacts to an archeological resource or value, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park’s GMP or other relevant NPS planning documents, there would be no impairment of the Park’s archeological resources and no unacceptable impacts.

Effects of Alternative 3a — Preferred Alternative

Impacts to archeological resources under Alternative 3a would range from negligible to minor depending upon the chosen location. The majority of the area has not been surveyed for archeological resources, and an inventory would be conducted prior to construction activities to identify previously undocumented archeological, historic, ethnographic, and/or cultural landscape resources. If any are found, NPS staff would consult with the Wyoming SHPO regarding additional actions needed to protect cultural resources. Direct and indirect effects would be mitigated by diverting the pathway in such a way as to avoid known resources.

Construction of multi-use pathways outside the road corridor along approximately 22.5 miles (36.0 km) and pathways within the road corridor along approximately 18.8 miles (30.3 km) would permanently disturb approximately 82.9 acres (33.5 ha) and cause temporary disturbance to approximately 82.9 additional acres (33.5 ha). The main differences between Alternative 3 and Alternative 3a are as follows: Alternative 3a includes the addition of

pathway spurs in two areas (North Jenny Lake Junction to String Lake and along Sagebrush Drive and Spring Gulch Road), and replacing the widened shoulder from North Jenny Lake Junction to Colter Bay with a pathway located within the road corridor. While impacts to cultural resources in these areas would be greater than under Alternative 3, the increment is expected to be negligible.

From the south boundary to North Jenny Lake Junction the effects from construction of multi-use pathways outside the road corridor would be the same as described for Alternative 3 (i.e., long term, localized, negligible to minor, and adverse). Ninety seven acres have been surveyed along the roadway between Dornan’s and South Jenny Lake; 12 archeological sites were already known to exist in this area and four new sites were identified during the survey, most of which occur east of the existing road. Placing the pathway on the west side of the road would most likely have fewer impacts to archeological resources than placing the pathway on the east side. Pathway spurs are proposed in two areas along this segment: North Jenny Lake Junction to String Lake and along Sagebrush Drive and the Spring Gulch Road. While the potential for impacts would be greater because of these additions, the overall effects would still be negligible to minor and localized with the implementation of mitigation measures.

Construction of multi-use pathways within the road corridor between North Jenny Lake Junction and Colter Bay (15.5 miles [25.0 km]) would have potentially long-term, localized, negligible to minor, adverse effects on archeological resources. Due to the terrain, pathway construction in this area would require a large amount of disturbance because of the need for cut and fill along slopes. Improving road shoulders between Signal Mountain Lodge and Jackson Lake Dam would permanently disturb approximately 0.9 acres (0.36 ha) and cause temporary disturbance of another 0.9 acres (0.36 ha) where construction equipment would be used adjacent to the main work area. Both Jenny Lake and Colter Bay developed areas have been inventoried for archeological resources; however, the area between these two locations has not been inventoried. Known sites located on the west side of the road would be avoided and surveys of the rest of the area would occur before implementation.

Pathways are proposed within the road corridor from the Granite Canyon Entrance Station to the LSR Preserve under Alternative 3a. The areas around the Granite Canyon Entrance Station and Poker Flats have been inventoried. No other archeological surveys have been conducted in the



areas along the Moose Wilson Road. Two sites occur on the west side of the road. It is likely that placing the pathway on the east side of the road would have fewer impacts to cultural resources than placing it on the west, based on past survey results and predictive factors. An inventory of the entire area would be conducted prior to implementation to determine specific siting resulting in long-term, localized, negligible to minor, adverse effects.

Construction of separate entrance lanes and installation of improved signage for pedestrian and wildlife safety and additional variable messaging signs would have the same effects as those described for Alternative 1. As described for Alternative 2, installation of information kiosks and improved way-finding would avoid impacts to archeological resources by siting these facilities in locations without known resources. Realignment of the Moose-Wilson Road and improvements to social trails would have the same effects as described for Alternative 3.

Cumulative Impacts

Current and planned projects within the Park that would affect archeological resources are similar to those described under Alternative 1. A combination of all past, present, and reasonably foreseeable future actions that could cause cumulative impacts would result in long-term, negligible to minor, and adverse impacts, depending upon chosen location and what is yet to be identified through future cultural resource inventories. Adverse impacts to the majority of cultural resources would be avoided by diverting the pathways around site locations.

Conclusion

Alternative 3a would result in potentially long-term, localized, negligible to minor, adverse impacts on known archeological sites located within the Park, depending on the number of resources affected and their data potential. Because many areas where resources are known to exist have either not been surveyed or have not been surveyed in accordance with SGAHP, additional research, fieldwork and consultation with the Wyoming SHPO and Native American tribal governments would be needed to determine whether these sites are eligible for listing in the NRHP. Should the sites be determined eligible for listing in the NRHP, the NPS would undertake required consultations with the Wyoming SHPO and Native American governments to make a determination of “no adverse effect” or “adverse effect.” Cumulative impacts would be long term, negligible to minor, and adverse.

Because there would be no major, adverse impacts to an archeological resource or value, for which conservation is

(1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park’s GMP or other relevant NPS planning documents, there would be no impairment of the Park’s archeological resources and no unacceptable impacts.

Effects of Alternative 4 — Multi-Use Pathways

Impacts to cultural resources under Alternative 4 would range from negligible to minor depending upon the chosen location. The majority of the area has not been surveyed for archeological resources, and an inventory would be conducted prior to construction activities to identify previously undocumented archeological, historic, ethnographic, and/or cultural landscape resources. If any are found, staff would consult with the Wyoming SHPO regarding additional actions needed to protect cultural resources. Direct and indirect effects would be mitigated by diverting the pathway in such a way as to avoid archeological resources.

Under Alternative 4, construction of multi-use pathways outside the road corridor along approximately 42.6 miles (68.4 km) of roads would permanently disturb approximately 85.1 acres [34.4 ha] and cause temporary disturbance to approximately 85.1 additional acres (34.4 ha). The main differences between Alternative 3a and Alternative 4 are as follows: Alternative 4 includes the construction of multi-use pathways outside the road corridor rather than within the road corridor from North Jenny Lake Junction to Colter Bay, and construction of multi-use pathways outside the road corridor along the entire the Moose-Wilson Road rather than just to the LSR Preserve. In addition, the pathway spurs to String Lake and along Sagebrush Road and Spring Gulch Drive would not be constructed under Alternative 4.

From the south boundary to North Jenny Lake Junction the effects from construction of multi-use pathways outside the road corridor would be the same as for Alternatives 3 and 3a (i.e., long term, localized, negligible to minor, and adverse). Ninety seven acres have been surveyed along the roadway between Dornan’s and South Jenny Lake; 12 archeological sites were already known to exist in this area and four new sites were identified during the survey, most of which occur east of the existing road. Placing the pathway on the west side of the road would most likely have fewer impacts to cultural resources than placing the pathway on the east side. The additional areas in this corridor would be surveyed before implementation.

Construction of multi-use pathways outside the road corridor between North Jenny Lake Junction and Colter Bay has the potential for removal of large amounts of vegetation that could lead to soil erosion and long-term, localized, negligible to minor, adverse effects on archeological resources. Construction of improved road shoulders between Signal Mountain Lodge and Jackson Lake Dam would permanently disturb approximately 2.0 acres (0.8 ha) and cause temporary disturbance of another 2.0 acres (0.8 ha) where construction equipment would be used adjacent to the main work area. Both Jenny Lake and Colter Bay developed areas have been inventoried for archeological resources; however, the area between these two locations has not been inventoried. Known sites located on the west side of the road would be avoided and surveys of the rest of the area would occur before implementation.

Construction of a multi-use pathway outside the road corridor along the Moose-Wilson Road from the Granite Canyon Entrance Station all the way to Moose could require the removal of 6,375 to 7,575 trees, depending on the specific design, and has a greater potential for disturbing cultural resources than Alternatives 3 and 3a. The areas around the Granite Canyon Entrance Station and Poker Flats have been inventoried. No other archeological surveys have been conducted along this portion of the Moose-Wilson Road. Two sites occur on the west side of the road. It is likely that placing the pathway on the east side of the road would have fewer impacts to cultural resources than placing it on the west, based on past survey results and predictive factors. An inventory of all locations would be conducted prior to any construction activity resulting in long-term, localized, negligible to minor, adverse effects.

Construction of separate entrance lanes and installation of improved signage for pedestrian and wildlife safety and additional variable messaging signs would have the same effects as those described for Alternative 1. As described for Alternative 2, installation of information kiosks and improved way-finding would avoid impacts to archeological resources by siting these facilities in locations without known resources. Realignment of the Moose-Wilson Road and improvements to social trails would have the same effects as described for Alternative 3.

Cumulative Impacts

Current and planned projects within the Park that would affect archeological resources are similar to those described under Alternative 1. A combination of all past,

present, and reasonably foreseeable future actions that could cause cumulative impacts would result in long-term, negligible to minor, adverse impacts, depending upon chosen location and what is yet to be identified through future cultural resource inventories. Adverse impacts to the majority of cultural resources would be avoided by diverting the pathways around site locations.

Conclusion

Alternative 4 would result in potentially long-term, localized, negligible to minor, adverse impacts on known archeological sites located within the Park, depending on the number of resources affected and their data potential. Because many areas where resources are known to exist have either not been surveyed or have not been surveyed in accordance with SGAHP, additional research, fieldwork and consultation with the Wyoming SHPO and Native American tribal governments would be needed to determine whether these sites are eligible for listing in the NRHP. Should the sites be determined eligible for listing in the NRHP, the NPS would undertake required consultations with the Wyoming SHPO and Native American governments to make a determination of “no adverse effect” or “adverse effect.” Cumulative impacts would be long term, negligible to minor, and adverse.

Because there would be no major, adverse impacts to an archeological resource or value, for which conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Grand Teton National Park; (2) key to natural or cultural integrity of the Park; or (3) identified as a goal in the Park’s GMP or other relevant NPS planning documents, there would be no impairment of the Park’s archeological resources and no unacceptable impacts.

Transportation System and Traffic

Methods and Assumptions

Impacts to the transportation system and traffic were analyzed relative to travel mode options available to visitors and employees under each alternative.

Future Park Visitation

Grand Teton National Park has not experienced substantial growth in annual recreational visitation over the past decade. Summer visitation has actually been on a slight downward trend, while shoulder season (spring and fall) and winter visitation have shown a modest upward trend. Because summer visitation is the largest share of annual visitation, the overall trend is unclear. At the same time,



there is no compelling evidence to expect that future visits to the Park would trend downward permanently. For purposes of this analysis, the assumption for Grand Teton National Park is that visitation would increase slightly throughout the life of this plan, from the current visitation of approximately 2.8 million visitors per year.

Motor Vehicle Traffic

Due to the relatively modest increases in visitation predicted through the life of this plan, future motor vehicle traffic is also expected to remain at or near current levels.

Effects of Alternative 1 — No Action

Under Alternative 1, adaptive management strategies would be tested on the Moose-Wilson Road; the Park would develop the TBP, but there would be no introduction of transit service; and no improvements in bicycling facilities would be made. Traffic is expected to increase only minimally in the next 5 to 10 years, resulting in minor impacts to the transportation system and traffic.

Parking areas at some of the most popular destinations currently experience varying levels of crowding during the peak visitation season. For example, parking at South Jenny Lake frequently fills to capacity by late morning and remains full until mid to late afternoon. During this period, it can be difficult to find a parking space, although turnover rates are frequent enough that patient visitors can often find a space. A few other parking areas also experience crowding, but to a somewhat lesser degree. Reconfiguration of some parking lots would help alleviate this issue. Generally, long-term, localized, minor, adverse impacts would continue under this alternative.

The Moose-Wilson Road provides a different experience than many of the other main roads in the Park. Due to its narrow width, limited sight distances, and slow speeds, it provides opportunities for visitors to experience the Park in a different way. The corridor is rich in wildlife values and is highly scenic. The road is not well constructed, lacks shoulders, and has no striping. A 2-mile (3.2-km) long section between the Granite Canyon Trailhead and the LSR Preserve is unpaved. The speed limit is 25 mph. Traffic volumes on the road are approximately 1,600 vehicles per day on the south end, and somewhat higher on the north end. Higher traffic volumes could result in deterioration of the road, especially the unpaved section, which already develops a rough and washboard surface during periods of peak use. In addition, the road is susceptible to congestion when wildlife or other attractions are present. Because the road is narrow and has few turnouts, visitors who stop to enjoy the views can easily block it.

Under this alternative, several different management strategies would be tested during the next 5 to 10 years, with the goal of maintaining the existing character of the road and protecting its important wildlife and scenic values. Management of the Moose-Wilson Road is expected to result in long-term, localized, minor to moderate, beneficial impacts on traffic in this area. Limitations on the amount of use on the Moose-Wilson Road could lead to commensurate increases in traffic volumes on routes outside the Park.

Improved signage for pedestrian and wildlife safety, installation of variable messaging signs, and separate entrance lanes would have a long-term, localized, minor, beneficial impact on traffic and transportation systems

| Impact Threshold Definitions | |
|------------------------------|--|
| Negligible | The effects would not be detectable and would have no discernable effect on traffic flow and/or road conditions. |
| Minor | The effects would be slightly detectable, but there would not be an overall effect on traffic flow and/or road conditions. |
| Moderate | The effects would be clearly detectable, and the action could have an appreciable effect on traffic flow and/or road conditions. |
| Major | The effects would be substantial, with a highly noticeable influence, and the traffic flow and/or road conditions could be permanently altered. |
| Duration | Short term — effects last 2 years or less. |
| | Long term — effects last longer than 2 years. |
| Area of Analysis | The principal paved and unpaved roadways within the Park, as described below, as well as parking areas located at pullouts, trailheads, and activity centers along these roadway corridors |

within the Park. Changes in the amount and timeliness of information dispersed to motorists would increase efficiency of roadway traffic and personal travel within the Park. Providing information to motorists about locations of congestion early on in their travels would enable motorists to choose other routes and reduce the amount of time spent waiting.

Cumulative Impacts

Within the Park, construction of a new visitor center at Moose and the LSR Preserve may increase visitation into the Park to see these new features in the short term. Reconstruction and widening of North Park Road between Lizard Creek Campground and the South Entrance of Yellowstone would improve this route for bicycling use. Related projects near Grand Teton National Park that would impact the transportation system include the reconstruction of Wyoming Highway 22, Wyoming Highway 390, U.S. Highway 26/287, and the expansion of Teton Village, all of which would occur outside the Park. WYDOT has anticipated traffic increases in these corridors as part of overall regional traffic, potentially increasing traffic coming into the Park. However, additional bike and pedestrian facilities planned around the Park, such as Jackson Hole Pathways Program, may encourage visitors to use alternative modes, thereby decreasing traffic in the Park. Overall, cumulative impacts under Alternative 1 are expected to be long term, minor, and adverse.

Conclusion

Alternative 1 would result in long-term, localized, negligible to minor, adverse impacts on roadways within the Park. On the Moose-Wilson Road, impacts would be long-term, localized, minor to moderate and beneficial. Long-term, localized, minor, adverse impacts would be expected at parking areas throughout the Park. Cumulative impacts would be long term, minor, and adverse.

Effects of Alternative 2 — Improved Road Shoulders

Under Alternative 2, short-term, minor construction-related activity affecting roadways would include the construction of improved shoulders along the Teton Park Road. These minor construction activities are expected to last a season or less and to incur only brief traffic impacts, such as short spells of on-site traffic control or flagmen. All construction activities are expected to have short-term, localized, negligible to minor, adverse impacts on traffic, as the construction activities would generate some traffic from construction vehicles and construction workers' personal vehicles. The additional traffic is expected to be short in

duration and relatively low. This alternative requires a limited amount of construction, and the transportation impacts would be long term, localized, negligible to minor, and adverse. In the long-term bicyclists would be able to travel this road on the improved shoulder. The Park would limit motorized traffic on Signal Mountain Road at certain times in order to provide increased access to bicyclists and pedestrians, which would cause some confusion for drivers in the short term while adjusting to this change.

Development of the TBP would determine whether it is feasible to begin a transit system in and around Grand Teton National Park. Under this alternative, pilot transit could be implemented based on the results of the TBP. Because the TBP would guide specific implementation details, it is difficult to estimate the impacts of a transit system in the Park. In general, however, the effects to traffic and transportation would be expected to be long term, regional, negligible to minor, and beneficial. A transit system would reduce personal vehicular traffic by slight amounts and would help reduce some traffic congestion (negligible, beneficial impacts).

As in Alternative 1, several different management strategies would be tested on the Moose-Wilson Road under this alternative during the next 5 to 10 years, with the goal of maintaining the existing character of the road and protecting its important wildlife and scenic values. Management of the Moose-Wilson Road is expected to result in long-term, localized, minor to moderate, beneficial impacts on traffic in this area. Limitations on the amount of use on the Moose-Wilson Road could lead to commensurate increases in traffic volumes on routes outside the Park.

Effects from improved signage for pedestrian and wildlife safety, installation of additional variable messaging signs, parking lot reconfiguration, and separate entrance lanes would be the same as described for Alternative 1. Information kiosks would be added and way finding would be improved, which could reduce vehicle trips and improve traffic flow in busy areas resulting in long-term, localized, minor, beneficial impacts. Changes in the amount and timeliness of information dispersed to motorists would increase efficiency of roadway traffic and personal travel within the Park. Providing information to motorists about locations of congestion early on in their travels would enable motorists to choose other routes and reduce the amount of time spent waiting. In addition, information would be provided to visitors about existing transit service



available in the area, which would lead some people to ride transit rather than take their own vehicle.

Cumulative Impacts

Cumulative impacts under Alternative 2 would be expected to be similar to those under Alternative 1, with a minor beneficial impact due to improving shoulders within the Park, which would connect to trails being planned outside of the Park, and the potential for implementation of transit. Overall, cumulative impacts would be long term, minor, and both beneficial and adverse.

Conclusion

Alternative 2 would generally result in impacts similar to those under the No Action Alternative, with the exception of short-term, localized, negligible to minor, adverse impacts resulting from construction of improved shoulders on the Teton Park Road. Improvements in the dissemination of information to park visitors would result in long-term, localized, minor, beneficial impacts. Long-term, regional, minor, beneficial impacts would also be expected from the connection to trails outside of the Park provided by widening shoulders, and the potential for implementation of transit. Cumulative impacts would be long term, minor, and both beneficial and adverse.

Effects of Alternative 3 — Improved Road Shoulders / Multi-Use Pathways

Under Alternative 3, short-term construction-related activity affecting roadways would include the construction of multi-use pathways outside the road corridor along approximately 23.3 miles (37.3 km) of roads, construction of improved shoulders along the Teton Park Road and North Park Road between North Jenny Lake Junction and Colter Bay (15.5 miles [25.0 km]), and realignment of two segments of the Moose-Wilson Road. In this alternative, the addition of roadway shoulders and construction to realign the Moose-Wilson Road would be the main sources of short-term construction-related transportation impacts, which would be localized, minor, and adverse, and the impacts from the rest of the construction activities would be negligible.

From the south boundary to North Jenny Lake Junction the effects from pathway construction outside the road corridor to transportation and traffic would be short term, localized, negligible to minor, and adverse, because the activity would not occur within the road corridor. Construction of a multi-use pathway outside the road corridor along a portion of the Moose-Wilson Road would also result in short-term, localized, negligible to minor, adverse, effects for the same reason.

Because improvements to shoulders from North Jenny Lake Junction to Colter Bay would require construction immediately adjacent to the existing roadway, short-term, localized, minor, adverse effects to traffic and transportation would occur in that area for the duration of the construction period. Realignment of the Moose-Wilson Road would also result in short-term, localized, minor, adverse construction impacts.

Realignment of the Moose-Wilson Road would alleviate some of the congestion that occurs because of wildlife viewing in those areas, resulting in a long-term, localized, minor, beneficial impact. Development of a system of multi-use pathways would also result in minor to moderate beneficial effects, due to the increased mode choices available to visitors in the Park. The system of multi-use pathways and improved shoulders would provide greater opportunities for bicyclists and pedestrians, which would slightly decrease vehicular traffic within the Park. However, the pathways system would actually increase demand for parking in some areas. When fully constructed, the pathways would provide a connection from Jackson to points along the Teton Park Road corridor (assuming construction by Teton County of a link to the south boundary). Many visitors, however, would likely choose to drive to locations within the Park, for example Moose or the Taggart Lake Trailhead, and begin bicycling from there. The additional demand for parking in order to accommodate this new use could result in long-term, localized, minor to moderate, adverse impacts at certain parking areas.

Development of the TBP would determine whether it is feasible to begin a transit system in and around Grand Teton National Park. Under this alternative pilot transit could be implemented based on the results of the TBP. Because the TBP would guide specific implementation details, it is difficult to estimate the impacts of a transit system in the Park. In general, however, the effects to traffic and transportation would be expected to be long term, regional, negligible to minor, and beneficial. A transit system would reduce personal vehicular traffic by slight amounts and would help reduce some traffic congestion (negligible, beneficial impacts).

Under this alternative, no changes to the management of roadways other than the Moose-Wilson Road would be made. As described under Alternative 1, different management options would be tested, resulting in variable effects along the Moose-Wilson Road, with potential beneficial effects if traffic volumes are moderated. The

AMP would potentially help reduce traffic on the north section of the road where there would be mixed use because no pathway is proposed. Limitations on the amount of use on the Moose-Wilson Road could lead to commensurate increases in traffic volumes on routes outside the Park.

Effects from improved signage for pedestrian and wildlife safety, installation of additional variable messaging signs, parking lot reconfiguration, and separate entrance lanes would be the same as described for Alternative 1. Information kiosks would be added and way-finding would be improved, which could reduce vehicle trips and improve traffic flow in busy areas resulting in long term, localized, minor, beneficial impacts as described for Alternative 2. Changes in the amount and timeliness of information dispersed to motorists would increase efficiency of roadway traffic and personal travel within the Park. Providing information to motorists about locations of congestion early on in their travels would enable motorists to choose other routes and reduce the amount of time spent waiting. In addition, information would be provided to visitors about existing transit service available in the area, which would lead some people to ride transit rather than take their own vehicle.

Cumulative Impacts

Cumulative impacts would occur from other past, present, and future actions that affect the Park's transportation system and traffic, as described under Alternative 1, but with additional beneficial and adverse impacts due to the creation of the multi-use pathways system. Impacts during construction would be short term, localized, negligible to minor, and adverse. Overall, cumulative impacts would be long term, minor, and beneficial.

Conclusion

Alternative 3 would result in both beneficial and adverse impacts to transportation and traffic. If implemented under Alternative 3, the transit system would provide additional options for visitors, but would not measurably alter the amount of traffic on the Park roads. Therefore, long-term impacts on traffic and park roadways because of this action would generally be regional, negligible to minor, and beneficial; however, the management strategies employed on the Moose-Wilson Road would result in long-term, localized, moderate, beneficial impacts. Long-term, localized, minor, adverse impacts would continue to affect some parking areas due to crowding at certain times, and selected parking areas would experience long-term, localized, minor to moderate, adverse impacts because of

new parking demand associated with use of the pathway system. Short-term impacts from the construction activities required for the addition of roadway shoulders and realignment of the Moose-Wilson Road would be localized, minor, and adverse, and the impacts from the rest of the construction activities would be negligible. Cumulative impacts to the transportation system are expected to be long term, minor, and beneficial.

Effects of Alternative 3a — Preferred Alternative

Under Alternative 3a, short-term construction-related activity affecting roadways would include the construction of multi-use pathways outside the road corridor along approximately 22.5 miles (36.0 km), pathways within the road corridor along approximately 18.8 miles (30.3 km), and realignment of two segments of the Moose-Wilson Road. Construction within the road corridor and realignment of the Moose-Wilson Road would be the main sources of short-term construction-related transportation impacts, which would be short term, localized, minor, and adverse, and the impacts from the rest of the construction activities would be negligible.

The main differences between Alternative 3 and Alternative 3a are as follows: Alternative 3a includes the addition of pathway spurs outside the road corridor in two areas (North Jenny Lake Junction to String Lake and along Sagebrush Drive and Spring Gulch Road), and a pathway within the road corridor rather than a widened shoulder from North Jenny Lake Junction to Colter Bay. Impacts from these actions would be similar to those described for Alternative 3 (short-term, localized, minor, and adverse).

From the south boundary to North Jenny Lake Junction the effects from construction of multi-use pathways outside the road corridor would be the same as described for Alternative 3 (i.e., short term, localized, negligible to minor, and adverse).

Construction of multi-use pathways within the road corridor between North Jenny Lake Junction and Colter Bay (15.5 miles [25.0 km]), including improving road shoulders between Signal Mountain Lodge and Jackson Lake Dam, would require construction immediately adjacent to the existing roadway; therefore, short-term, localized, minor, adverse effects to traffic and transportation would occur in that area for the duration of the construction period.

Pathways are proposed within the road corridor from the Granite Canyon Entrance Station to the LSR Preserve



under Alternative 3a resulting in impacts similar to those from work within the road corridor from North Jenny Lake Junction and Colter Bay. The temporary effects to traffic and transportation in this area would likely be greater however due to the narrow road corridor (i.e., short-term, localized, minor to moderate, adverse effects).

Realignment of the Moose-Wilson Road would alleviate some of the congestion that occurs because of wildlife viewing in those areas, resulting in a long-term, localized, minor, beneficial impact. Development of a system of multi-use pathways would also result in long-term, regional, minor to moderate, beneficial effects, due to the increased mode choices available to visitors in the Park. The system of multi-use pathways and improved shoulders would provide greater opportunities for bicyclists and pedestrians, which would slightly decrease vehicular traffic within the Park. The pathway proposed along the Moose-Wilson Road under this alternative would provide additional opportunities for bicyclists to travel along this corridor.

However, the expanded pathways system would actually increase demand for parking in some areas. When fully constructed, the pathways would provide a connection from Jackson to points along the Teton Park Road corridor (assuming construction by Teton County of a link to the south boundary). Many visitors, however, would likely choose to drive to locations within the Park, for example Moose or the Taggart Lake Trailhead, and begin bicycling from there. The additional demand for parking in order to accommodate this new use could result in long-term, localized, minor to moderate, adverse impacts at certain parking areas.

Development of the TBP would determine whether it is feasible to begin a transit system in and around Grand Teton National Park. As described for Alternatives 2 and 3, pilot transit could be implemented based on the results of the TBP. Because the TBP would guide specific implementation details, it is difficult to estimate the impacts of a transit system in the Park. In general, however, the effects to traffic and transportation would be expected to be long term, regional, negligible to minor, and beneficial. A transit system would reduce personal vehicular traffic by slight amounts and would help reduce some traffic congestion (negligible, beneficial impacts).

As described under Alternative 1, different management options would be tested, resulting in variable effects along the Moose-Wilson Road, with potential beneficial effects if traffic volumes are moderated. The AMP would potentially

help reduce traffic on the north section of the road where there would be mixed use because no pathway is proposed. Limitations on the amount of use on the Moose-Wilson Road could lead to commensurate increases in traffic volumes on routes outside the Park.

Effects from improved signage for pedestrian and wildlife safety, installation of additional variable messaging signs, parking lot reconfiguration, and separate entrance lanes would be the same as described for Alternative 1. Information kiosks would be added and way-finding and social trails would be improved, which could reduce vehicle trips and improve traffic flow in localized areas resulting in long term, localized, minor, beneficial impacts as described for Alternative 2. Changes in the amount and timeliness of information dispersed to motorists would increase efficiency of roadway traffic and personal travel within the Park. Providing information to motorists about locations of congestion early on in their travels would enable motorists to choose other routes and reduce the amount of time spent waiting. In addition, information would be provided to visitors about existing transit service available in the area, which would lead some people to ride transit rather than take their own vehicle.

Cumulative Impacts

Cumulative impacts would occur from other past, present, and future actions that affect the Park's transportation system and traffic, as described under Alternative 1, but with additional beneficial and adverse impacts due to the expansion of the multi-use pathways system and the potential for the development of transit within the Park. Overall, cumulative impacts to the transportation system are expected to be long term, minor, and beneficial.

Conclusion

Alternative 3a would result in both beneficial and adverse impacts to transportation and traffic. If implemented under Alternative 3a, the transit system would provide additional options for visitors but would not measurably alter the amount of traffic on the Park roads. Therefore, long-term impacts on traffic and park roadways as a result of this action would generally be regional, negligible to minor, and beneficial; however, the management strategies employed on the Moose-Wilson Road would result in long-term, localized, moderate, beneficial impacts. Minor adverse impacts would continue to affect some parking areas due to crowding at certain times, and selected parking areas would experience long-term, localized, minor to moderate, adverse impacts because of new parking demand associated with use of the pathway system. Short-term impacts from

the construction activities required for the widening of roadway shoulders and realignment of the Moose-Wilson Road would be localized, minor, and adverse, and the impacts from the rest of the construction activities would be negligible. Cumulative impacts to the transportation system are expected to be long term, minor, and beneficial.

Effects of Alternative 4 — Multi-Use Pathways

Under Alternative 4, short-term construction-related activity affecting roadways would include the construction of 42.6 miles (68.4 km) of multi-use pathways outside the road corridor and realignment of two segments of the Moose-Wilson Road. Construction to realign the Moose-Wilson Road would be the main source of short-term construction-related transportation impacts, which would be short-term, localized, minor, and adverse, and the impacts from the rest of the construction activities would be short term, localized, negligible to minor, and adverse.

The main differences between Alternative 3a and Alternative 4 are as follows: Alternative 4 includes the construction of multi-use pathways outside the road corridor rather than within the road corridor from North Jenny Lake Junction to Colter Bay, and construction of multi-use pathways outside the road corridor along the entire the Moose-Wilson Road rather than just to the LSR Preserve. In addition the pathway spurs to String Lake and along Sagebrush Drive and Spring Gulch Road would not be constructed.

From the south boundary to North Jenny Lake Junction the effects from construction of multi-use pathways outside the road corridor would be the same as for Alternative 3 (i.e., short-term, localized, negligible to minor, and adverse).

Construction of multi-use pathways outside the road corridor between North Jenny Lake Junction and Colter Bay would have short-term, localized, negligible to minor, adverse effects on traffic and transportation because the construction activities would not occur within the road corridor. Construction of a multi-use pathway outside the road corridor along the entire the Moose-Wilson Road would have similar effects (i.e., short term, localized, negligible to minor, and adverse) for the same reason.

Realignment of the Moose-Wilson Road would alleviate some of the congestion that occurs because of wildlife viewing in those areas, resulting in a long-term, localized, minor, beneficial impact. Development of a system of multi-use pathways would also result in long-term, regional, minor to moderate, beneficial effects, due to the increased mode choices available to visitors in the Park. The system of

multi-use pathways and improved shoulders would provide greater opportunities for bicyclists and pedestrians, which would slightly decrease vehicular traffic within the Park. The pathway proposed outside the Moose-Wilson Road corridor under this alternative would provide additional opportunities for bicyclists to travel along this corridor.

However, the expanded pathways system would actually increase demand for parking in some areas. When fully constructed, the pathways would provide a connection from Jackson to points along the Teton Park Road corridor (assuming construction by Teton County of a link to the south boundary). Many visitors, however, would likely choose to drive to locations within the Park, for example Moose or the Taggart Lake Trailhead, and begin bicycling from there. The additional demand for parking in order to accommodate this new use could result in long-term, localized, minor to moderate, adverse impacts at certain parking areas.

Development of the TBP would determine whether it is feasible to begin a transit system in and around Grand Teton National Park. As described for Alternatives 2, 3, and 3a, pilot transit could be implemented based on the results of the TBP. Because the TBP would guide specific implementation details, it is difficult to estimate the impacts of a transit system in the Park. In general, however, the effects to traffic and transportation would be expected to be long term, regional, negligible to minor, and beneficial. A transit system would reduce personal vehicular traffic by slight amounts and would help reduce some traffic congestion (negligible, beneficial impacts).

As described under Alternative 1, different management options would be tested, resulting in variable effects along the Moose-Wilson Road, with potential beneficial effects if traffic volumes are moderated. Limitations on the amount of use on the Moose-Wilson Road could lead to commensurate increases in traffic volumes on routes outside the Park.

Effects from improved signage for pedestrian and wildlife safety, installation of additional variable messaging signs, parking lot reconfiguration, and separate entrance lanes would be the same as described for Alternative 1. Information kiosks would be added and way-finding and social trails would be improved, which could reduce vehicle trips and improve traffic flow in localized areas resulting in long term, localized, minor beneficial impacts as described for Alternative 2. Changes in the amount and timeliness of information dispersed to motorists would increase efficiency of roadway traffic and personal travel within the Park. Providing information to motorists about locations of



congestion early on in their travels would enable motorists to choose other routes and reduce the amount of time spent waiting. In addition, information would be provided to visitors about existing transit service available in the area, which would lead some people to ride transit rather than take their own vehicle.

Cumulative Impacts

Cumulative impacts would occur from other past, present, and future actions that affect the Park's transportation system and traffic, as described under Alternative 1, but with additional beneficial and adverse impacts due to the expansion of the multi-use pathways system. Overall, cumulative impacts to the transportation system are expected to be long term, minor, and beneficial.

Conclusion

Alternative 4 would result in both beneficial and adverse impacts to transportation and traffic. If implemented under Alternative 4, the transit system would provide additional options for visitors but would not measurably alter the amount of traffic on park roads. Therefore, long-term impacts on traffic and park roadways as a result of this action would generally be regional, negligible to minor, and beneficial; however, the management strategies employed on the Moose-Wilson Road would result in long-term, localized, moderate, beneficial impacts. Long-term, localized, minor, adverse impacts would continue to affect some parking areas due to crowding at certain times, and selected parking areas would experience long-term, localized, minor to moderate, adverse impacts because of new parking demand associated with use of the pathway system. Short-term impacts from the construction activities required for the realignment of the Moose-Wilson Road would be localized, minor, and adverse, and the impacts from the rest of the construction activities would be short-term, localized, negligible to minor, and adverse. Cumulative impacts to the transportation system are expected to be long term, minor, and beneficial.

Visitor and Employee Use and Experience

Methods and Assumptions

For park visitors, this impact analysis considers various aspects of visitor use and experience at Grand Teton National Park, including the effects on:

- Visitors' ability to experience the Park's primary resources and their natural and cultural settings (e.g., vistas, natural sounds and scents, and wildlife viewing).

- Access and quality of movement throughout the Park (e.g., level of freedom/spontaneity, reliability, affordability, timeliness, availability of facilities, access to places of interest, convenience, minimal congestion, continuous system of connections, and level of universal access).
- Access to orientation and interpretation information (e.g., availability and appropriateness).
- Access to high quality recreation opportunities (e.g., access to diverse recreation opportunities, including turn-around trips, new recreation activities, tranquil/contemplative environments, opportunities for social interaction with family/friends, and opportunities to meet new people).
- Visitor safety (both real and perceived).

The analysis is based on how visitor use and experiences would change with the way potential management actions were applied in the alternatives. A major focus of the impact assessment is the degree to which visitors are able to visit the major destinations in the Park safely, comfortably, and freely.

Information gathered in the visitor survey discussed in Chapter 3, "Affected Environment," along with public input during the planning process, was used to evaluate the potential impacts of each alternative on visitors. Based on these sources of information, visitors have expressed that scenic views and preservation of native plants and animals are important to their experiences in the Park. In addition, visitors have expressed concern about congestion and crowding at major destination points, conflicts with traffic along roadways, unsafe bicycle and pedestrian access, and lack of continuous pathway and multi-use pathway opportunities for both recreation and travel opportunities. An important consideration regarding evaluation of visitor experience impacts is that impacts would vary based on visitor expectations and desires, which are often a result of level of experience with the Park or similar park environments.

For park employees, two measures of transportation system impacts on employee experience are considered: the employee's level of mobility to work sites and locations associated with activities of daily living (shopping, worship, etc.), and the quality of the travel experience, as measured by reliability of transportation, cost, and commuting time. These variables have been assessed in a qualitative manner using information from the 2001 Employee Transportation Survey on employees' current mobility options and

constraints, as well as typical destinations. It has been assumed that responses to the employee survey are an accurate representation of those that would be given by the employee population as a whole.

Effects of Alternative 1 — No Action

Visitor Use and Experience

Under the No Action Alternative (Alternative 1), no changes would be made regarding the types of recreational opportunities and experiences that are available to park visitors. Popular activities include general sightseeing, driving for pleasure, hiking, floating the Snake River, wildlife viewing, mountain climbing, bicycling, and fishing. Annual surveys of park visitors taken between 2000 and 2004 in order to comply with the Government Performance and Results Act have indicated that on average, 99 percent of visitors are satisfied overall with the services, facilities, and recreational opportunities provided at Grand Teton National Park (University of Idaho 2004).

Visitation to the Park over the next 5 to 10 years is expected to remain relatively steady or increase slightly. Visitation trends are difficult to predict and are influenced by a wide variety of factors including population growth, economic trends, demographics, recreational preferences, gas prices, and weather. The anticipated visitation trends over this period would result in some popular parking areas becoming full earlier in the day and staying full longer and possibly extending the length of the peak visitation season, resulting in generally long-term, localized, minor, adverse impacts on visitor experience.

Pleasure driving would continue to be a highly popular activity and visitors would continue to have the freedom to travel throughout the Park at their own pace and choose destinations of interest. Localized traffic congestion would continue to occur, generally in conjunction with wildlife sightings. Although traffic congestion can be assumed to cause short-term, localized, moderate, adverse impacts on visitor experience, the opportunity to stop and view wildlife is considered by most visitors to be beneficial to their visit and enhances their enjoyment of the Park. The TBP would be developed under this alternative; however, no transit would be implemented.

Within some of the activity areas in the Park, visitors currently choose to drive relatively short distances rather than walk between nearby destinations. For example, at Jenny Lake, it is common for campers to drive their cars between the campground and the Jenny Lake Store, even though the two destinations are within easy walking distance. Pedestrians within the activity areas often tend to walk through parking lots or on social trails. Inadequate signing and a lack of clearly identifiable walking paths contribute to this activity, which results in unnecessary auto travel and competition for parking spaces. Under the No Action Alternative, these issues would be addressed on a case-by-case basis, with existing conditions persisting based on the availability of resources available to address the problems. Impacts on visitor experience because of this would be expected to be short and long term, localized, minor, and adverse. Construction of separate entrance lanes and reconfiguration of some parking areas would improve the visitor experience by reducing congestion and waiting times.

| Impact Threshold Definitions | |
|-------------------------------------|--|
| Negligible | Visitors or employees would not be affected, or changes in their experience would be below or at the level of detection. The visitor or employee would not likely be aware of the effects associated with the alternative. |
| Minor | Changes in visitor or employee use and/or experience would be slight but detectable, would affect few individuals, and would not appreciably limit or enhance experiences identified as fundamental to the Park's purpose and significance. |
| Moderate | Some characteristics of visitor or employee use and/or experience would change, and many individuals would likely be aware of the effects associated with implementation of the alternative; some changes to experiences identified as fundamental to the Park's purpose and significance would be apparent. |
| Major | Multiple characteristics of visitor or employee experience would change, including experiences identified as fundamental to park purpose and significance; most individuals would be aware of the effects associated with implementation of the alternative and would likely express a strong opinion about the changes. |
| Duration | Short term — occurs only during the treatment effect. |
| | Long term — occurs after the treatment effect. |
| Area of Analysis | Within park boundary and, for employees, areas within and outside of the Park frequented by employees, including the major transportation corridors; the employee housing areas and major commuting patterns; and major commercial and civic destinations in the Town of Jackson. |



Opportunities for bicycling exist throughout the Park; however, bicycles are limited to the same roadways used by automobiles. The relatively flat topography of Jackson Hole makes bicycling an attractive recreational option, although only a small percentage of park visitors engage in this activity while visiting the Park. In recent years, approximately 180 organized commercial bicycling tours have served approximately 2,000 visitors annually. A 2001 survey indicated that 2.3 percent of inbound vehicles at the Moose Entrance Station carried one or more bicycles.

While bicycling is permitted on all the Park roads, not all visitors are comfortable with sharing the road with high-speed motor vehicle traffic. Road shoulders vary in width from almost non-existent to 5.0 ft (1.5 m). The inherent and perceived risks of bicycling on road shoulders would discourage some visitors from bicycling altogether, and would adversely affect the experience for others by requiring them to concentrate on traffic and their own safety rather than the scenic views. Although rare, accidents have the potential to be serious, and two fatalities have occurred in recent years. Under the No Action Alternative, no improvements would be made with regard to bicycling facilities, resulting in long-term, localized, minor to moderate, adverse impacts on visitor experience.

Several different adaptive management strategies would be tested on the Moose-Wilson Road over the next few years, with the objective of managing traffic volumes to retain the existing character of the road corridor. Under all strategies, two-way traffic would be maintained from Moose to the LSR Preserve and from the Granite Canyon Entrance Station to the Granite Canyon Trailhead. Between the Granite Canyon Trailhead and the LSR Preserve, the NPS may test strategies such as direction of traffic flow or other techniques to manage vehicle use of the road. In any event, the Park would work closely with the local community in order to develop and publicize adaptive management strategies well in advance of their implementation in order to avoid confusion and disruption, and mitigate potential impacts.

The effect of these adaptive management strategies would result in both beneficial and adverse impacts on visitor experience, and would vary between different strategies. Overall, most visitors using the Moose-Wilson Road would experience a long-term, localized, negligible to minor, beneficial impact because the current character of the road would be maintained. Some visitors would be inconvenienced under some management strategies if they were not able to travel in the direction they desired

or reach one of the trailheads without driving around through Jackson. In general, implementation of the various strategies would result in long-term, localized, minor, beneficial and adverse impacts.

Employee Use and Experience

Under this alternative, no changes in the management of employee transportation in the Park would be expected. Employees with access to vehicles would continue to have high mobility to their work sites. Employees without access to a personal vehicle would continue to rely on concession-provided transit, ride to work with colleagues, or walk or bike to and from work.

The slight increase in traffic volumes on park roadways through the life of this plan (5 to 10 years) would have an effect on the length of employee commutes and the quality of that commute. Long-term impacts on commuting times would be regional, negligible to minor, and adverse. Construction of separate entrance lanes for employees would reduce the time waiting at the gate resulting in long term, localized, negligible to minor, beneficial impacts. The TBP would be developed under this alternative; however, no transit would be implemented. Managing traffic volumes by testing management strategies on the Moose-Wilson Road could reduce the options available for commuting on this route.

Cumulative Impacts

Grand Teton National Park is one component of the GYA, which includes YNP, several national forests, the National Elk Refuge, and communities such as Jackson and Cody, Wyoming; West Yellowstone, Gardiner, and Bozeman, Montana; and Idaho Falls, Idaho. Visits to Grand Teton National Park are often combined with visits to a wide variety of destinations elsewhere in the three-state area, and a virtually unlimited array of opportunities and experiences are available throughout the GYA.

Within the Park, a new visitor center is under construction at Moose, which will provide improved opportunities for education and information about the Park, as well as how to best visit it. Reconstruction of North Park Road would facilitate travel between the south entrance of Yellowstone and Lizard Creek Campground. Improved shoulders on that section of road would provide improved opportunities for bicycling. Likewise, reconstruction of U.S. Highway 287/26 over Togwotee Pass by WYDOT would improve opportunities for both automobile and bicycle travel.

The impacts of these related actions, in conjunction with the impacts of Alternative 1, would result in long-term, negligible to minor, adverse cumulative impacts to employee commuting time, and long-term, negligible, beneficial cumulative impacts on employee mobility choices; cumulative impacts on visitor experience would be long-term, moderate, and beneficial.

Conclusion

Overall, implementation of Alternative 1 would result in short and long term, localized and regional, minor to moderate, beneficial and adverse impacts on visitor and employee use and experience. Cumulative impacts would include long-term, negligible to minor, adverse cumulative impacts to employee commuting time; long-term, negligible, beneficial cumulative impacts on employee mobility choices; and long-term, moderately beneficial cumulative impacts on visitor experience.

Effects of Alternative 2 — Improved Road Shoulders

Visitor Use and Experience

The effects of Alternative 2 would be generally the same as described for Alternative 1, except that improved road shoulders from Moose to Signal Mountain Lodge would provide a long term, regional, minor to moderate, beneficial impact on visitor use and experience by enhancing the quality and safety of bicycling opportunities. In addition, periodic closure of Signal Mountain Road to allow for non-motorized uses would also provide a long-term, localized, minor, beneficial impact on visitor experience for some visitors; conversely, visitors who desire to visit the summit by automobile could be adversely affected if they were unable to schedule that activity around the periods when the road was closed.

As described for Alternative 1, the effect of adaptive management strategies on the Moose-Wilson Road would result in both beneficial and adverse impacts on visitor experience, and would vary between different strategies. Overall, most visitors using the Moose-Wilson Road would experience a long-term, localized, negligible to minor, beneficial impact because the current character of the road would be maintained. Some visitors could be inconvenienced under certain management strategies if they were not able to travel in the direction they desire, travel all the way through, or reach one of the trailheads without driving around through Jackson. In general, implementation of the various strategies would result in short-term, localized, negligible to moderate impacts, both beneficial and adverse.

The TBP will be developed under this alternative, and a pilot transit program could be implemented pending the results of the study. Visitors would receive additional information about existing transit in the area that would help with trip planning and would reduce traffic congestion.

Construction of separate entrance lanes and reconfiguration of some parking areas would improve the visitor experience by reducing congestion and waiting times. Beneficial impacts relative to the No Action Alternative would also result from improved traveler information, such as information kiosks, improved way-finding, enhanced use of four additional variable messaging signs, and traveler information radio broadcasts.

Employee Use and Experience

Under this alternative, improved shoulders would be constructed along the Teton Park Road. The 5.0 ft (1.5 m) shoulder from Jackson to Moose would be extended to Signal Mountain Lodge along the Teton Park Road, providing employees that choose to bicycle commute from Jackson a continuous bike lane along the shoulder, a long-term, regional, minor to moderate, beneficial impact. Employees with access to vehicles would continue to have high mobility to work sites. Those employees without access to a personal vehicle would continue to rely on concession-provided transit, rides from co-workers, or walking or bicycling to and from work.

Short-term construction-related impacts on visitor and employee experience would be expected to consist of short delays on some localized areas of roadways, which would affect visitor access to certain locations, the commute to and from work, and work-related travel within the Park. The overall short-term impact to visitor and employee experience would be localized, negligible to moderate, and adverse.

Construction of separate entrance lanes for employees would reduce the time waiting at the gate resulting in long term, localized, negligible to minor, beneficial impacts. The TBP would be developed under this alternative and a pilot transit program would be implemented pending the results of the study. Depending on the transit options chosen, employee level of mobility and quality of travel experience could increase, decrease or stay the same, similar to Alternative 1. Managing traffic volumes by testing management strategies on the Moose-Wilson Road would also have an effect on employee use of the road by reducing the options available for commuting on this route.



Cumulative Impacts

Cumulative impacts would be generally the same as those described under Alternative 1, with long-term, negligible to minor, adverse cumulative impacts to employee commuting time, long-term, negligible, beneficial cumulative impacts on employee mobility choices; and long-term, moderately beneficial cumulative impacts on visitor experience.

Conclusion

Overall, implementation of Alternative 2 would result in long-term, regional and localized, minor to moderate, beneficial impacts, and short-term, localized, negligible to moderate, adverse impacts on visitor and employee use and experience. Cumulative impacts would include long-term, negligible to minor, adverse cumulative impacts to employee commuting time; long-term, negligible, beneficial cumulative impacts on employee mobility choices; and long-term, moderately beneficial cumulative impacts on visitor experience.

Effects of Alternative 3 — Improved Road Shoulders / Multi-Use Pathways

Visitor Use and Experience

Compared to Alternative 1, implementation of Alternative 3 would result in additional long-term, regional, moderate to major, beneficial impacts on visitor experience due to the availability of approximately 23.3 miles (37.3 km) of multi-use pathways outside the road corridor and 15.5 miles (25.0 km) of improved road shoulders. These improvements would enhance opportunities for safe and enjoyable bicycling in the Park, a moderate to major beneficial impact. Although a relatively small percentage of visitors currently engage in bicycling while visiting the Park, it could be expected that the popularity of this activity would increase because of the new facilities.

In addition, implementation of a limited transit system, pending the results of the TBP, would result in long-term, regional, minor, beneficial impacts by providing a means for visitors to access certain areas of the Park without the need to depend on private automobiles. It is anticipated that this additional service would tend to serve visitors (and employees) having a single or limited number of destinations for the day (or a large portion of a day), rather than as an alternative to pleasure driving or touring the Park. For example, the shuttle service could allow lodge and campground guests to access a trailhead in the Park from which to begin a hike, without having the need for a car. It could also provide a shuttle between various trailheads, making possible circuit hikes that cannot currently be done without having two cars. Transit vehicles

would be equipped with bicycle carriers in order to allow visitors to reach certain parts of the pathway system without having to ride the entire distance. Visitors would receive additional information about existing transit in the area that would help with trip planning and would reduce traffic congestion.

Adverse effects on visitor use and experience would result from the construction of approximately 23.3 miles (37.3 km) of multi-use pathways. These new facilities would, to varying degrees, intrude upon the natural landscape and therefore adversely affect the experience of some visitors by increasing the development footprint and thereby altering the character of the road corridors from less developed to more developed.

Realignment of the Moose-Wilson Road would have short-term, localized, moderate, adverse effects on commuting times and quality of travel experience for both visitors and park personnel; however, these would only be short-term construction-related impacts and would have a long-term, localized, minor to moderate, beneficial impact on transportation and traffic along the Moose-Wilson Road.

As described for Alternative 1, the effect of adaptive management strategies on the Moose-Wilson Road would result in both beneficial and adverse impacts on visitor experience, and would vary between different strategies. Overall, most visitors using the Moose-Wilson Road would experience a long-term, localized, minor, beneficial impact because the current character of the road would be maintained. Some visitors could be inconvenienced under some management strategies if they were not able to travel in the direction they desired or reach one of the trailheads without driving around through Jackson. In general, implementation of the various strategies would result in short-term, localized, minor impacts, both beneficial and adverse.

Construction of separate entrance lanes and reconfiguration of some parking areas would improve the visitor experience by reducing congestion and waiting times. Long-term, localized, negligible to minor, beneficial impacts relative to the No Action Alternative would also result from improved traveler information, such as information kiosks, improved way finding, enhanced use of four additional variable messaging signs, and traveler information radio broadcasts. Work to improve the management of social trails and additional way finding would occur under this alternative improving the visitor experience.

Employee Use and Experience

Under this alternative, multi-use pathways would be provided outside the road corridor along high-use roadways, safer bicycling routes would be available for employees, and social trails would be improved and delineated in several activity areas. The safety, convenience, and quality of travel for employees who cycle or walk to and from work would be improved. Pathways would connect Jackson to Moose and Beaver Creek to Moose. An improved bicycle shoulder would connect Colter Bay and Jackson Lake Lodge. Improvements in pathway systems at activity areas would connect employee housing to the main activity areas within Colter Bay and Signal Mountain Lodge.

The TBP would be developed under this alternative, and a pilot transit service could be implemented. Pilot transit could include routes between Jackson and Moose, Jenny Lake, and Colter Bay via the Teton Park Road. Employees with access to vehicles could continue to commute to work by personal vehicle. The pilot transit service would provide a convenient alternative, though with possibly longer commute times. Employees without access to a personal vehicle would experience improved mobility options. Access to work sites and recreation opportunities would be available for almost all employees in the Park.

Short-term construction-related impacts on employee experience would be expected to consist of short delays on some localized areas of roadways, which would affect access to certain locations, the commute to and from work, and work-related travel within the Park for some employees (see “Transportation System and Traffic” section above). The impact to employee experience would be short-term, localized, negligible to minor, and adverse.

Construction of separate entrance lanes for employees would reduce the time waiting at the gate resulting in long term, localized, negligible to minor, beneficial impacts. Managing traffic volumes by testing management strategies on the Moose-Wilson Road would have an effect on employee use of the road by reducing the options available for commuting on this route.

Cumulative Impacts

Cumulative impacts on visitor experience would be generally the same as under the other alternatives. Recent, current, and planned projects within Grand Teton National Park that would influence employee mobility within the Park are the same as for Alternative 1. The impacts of these related actions, in conjunction with the impacts of Alternative 3, would result in long-term, negligible to

minor, adverse cumulative impacts to employee commuting time, long-term, negligible, beneficial cumulative impacts on employee mobility choices; and long-term, moderately beneficial cumulative impacts on visitor experience.

Conclusion

Overall, implementation of Alternative 3 would result in long-term, localized and regional, minor to major, beneficial impacts associated with the additional pathways and transit, and short- and long-term, localized, negligible to moderate, adverse impacts on visitor and employee use and experience associated with the change to the landscape. Cumulative impacts would include long-term, negligible to minor, adverse cumulative impacts to employee commuting time; long-term, negligible, beneficial cumulative impacts on employee mobility choices; and long-term, moderately beneficial cumulative impacts on visitor experience.

Effects of Alternative 3a — Preferred Alternative

Visitor Use and Experience

Compared to the No Action Alternative, implementation of Alternative 3a would result in additional long-term, localized and regional, moderate to major, beneficial impacts on visitor experience due to the availability of approximately 22.5 miles (36.0 km) of multi-use pathways outside the road corridor and 18.8 miles (30.3 km) of multi-use pathways within the road corridor. These improvements would enhance opportunities for safe and enjoyable bicycling in the Park, a moderate to major beneficial impact. Although a relatively small percentage of visitors currently engage in bicycling while visiting the Park, it could be expected that the popularity of this activity would increase because of the new facilities.

The main differences between Alternative 3 and Alternative 3a are as follows: Alternative 3a includes the addition of pathway spurs in two areas (North Jenny Lake Junction to String Lake and along Sagebrush Drive and Spring Gulch Road), and the pathway within the road corridor rather than a widened shoulder from North Jenny Lake Junction to Colter Bay. These actions would result in long-term, beneficial impacts to visitor experience.

In addition, implementation of a limited transit system, pending the results of the TBP, would result in long-term, regional, minor, beneficial impacts by providing a means for visitors to access certain areas of the Park without the need to depend on private automobiles. It is anticipated that this additional service would tend to serve visitors



(and employees) having a single or limited number of destinations for the day (or a large portion of a day), rather than as an alternative to pleasure driving or touring the Park. For example, the shuttle service could allow lodge and campground guests to access a trailhead in the Park from which to begin a hike, without having the need for a car. It could also provide a shuttle between various trailheads, making possible circuit hikes that cannot currently be done without having two cars. Transit vehicles would be equipped with bicycle carriers in order to allow visitors to reach certain parts of the pathway system without having to ride the entire distance. Visitors would receive additional information about existing transit in the area that would help with trip planning and could reduce traffic congestion.

Adverse effects on visitor use and experience would also result from the construction of multi-use pathways. These new facilities would, to varying degrees, intrude upon the natural landscape and therefore adversely affect the experience of some visitors by increasing the development footprint and altering the character of the road corridor through increased development. Construction of a pathway within the road corridor along a portion of the Moose-Wilson Road would noticeably alter the character of the area resulting in long-term, localized, minor to moderate, adverse impacts on visitor use and experience. Similar impacts would also occur on forested sections of the Teton Park Road and North Park Road.

Realignment of the Moose-Wilson Road would have short-term, localized, moderate, adverse effects on commuting times and quality of travel experience for both visitors and park personnel; however, these would only be short-term construction-related impacts and would have a long-term, localized, minor to moderate, beneficial impact on transportation and traffic along the Moose-Wilson Road.

As described for Alternative 1, the effect of management strategies on the Moose-Wilson Road would result in both beneficial and adverse impacts on visitor experience, and would vary between different strategies. Overall, most visitors using the Moose-Wilson Road would experience a long-term, localized, minor, beneficial impact because the current character of the road would be maintained. Some visitors could be inconvenienced under some management strategies if they were not able to travel in the direction they desired or reach one of the trailheads without driving around through Jackson. In general, implementation of the various strategies would result in short-term, localized, minor impacts, both beneficial and adverse.

Construction of separate entrance lanes at entrance stations and reconfiguration of some parking areas would improve the visitor experience by reducing congestion and waiting times. Long-term, localized, negligible to minor, beneficial impacts relative to the No Action Alternative would also result from improved traveler information, such as information kiosks, improved way finding, enhanced use of four additional variable messaging signs, and traveler information radio broadcasts. Work to social trails and additional way finding in high visitor use areas would occur under this alternative improving the visitor experience.

Employee Use and Experience

Under this alternative, a larger system of multi-use pathways would be provided along high-use roadways, safer bicycling routes would be available for employees, and social trails would be improved and delineated in several activity areas. The safety, convenience, and quality of travel for employees who bicycle and walk to and from work would be improved. Multi-use pathways would connect Moose to Jackson, Teton Village, Beaver Creek, South Jenny Lake, and points further north. Improvements in pathway systems at activity areas would connect employee housing to the main activity areas within Colter Bay and Signal Mountain Lodge.

If implemented pending the results of the TBP, a pilot transit program could provide service between Jackson and Moose, Jenny Lake, and Colter Bay via the Teton Park Road. Employees with access to vehicles could continue to commute to work by personal vehicle. The pilot transit service could provide a convenient alternative, though with possibly longer commute times. Employees without access to a personal vehicle would experience improved mobility options. Access to work sites and recreation opportunities would be available for almost all employees in the Park.

Short-term construction-related impacts on employee experience would be expected to consist of short delays on some localized areas of roadways, which would affect access to certain locations, the commute to and from work, and work-related travel within the Park, for some employees. The impact to employee experience would be short-term, localized, negligible to minor, and adverse. Construction of separate entrance lanes for employees would reduce the time waiting at the gate resulting in long term, localized, negligible to minor, beneficial impacts. Managing traffic volumes by testing management strategies on the Moose-Wilson Road would have an effect on employee use of the road by reducing the options available for commuting on this route.

Cumulative Impacts

Cumulative impacts on visitor experience would be generally the same as under the other alternatives. Recent, current, and planned projects within Grand Teton National Park that would influence employee mobility within the Park are the same as for Alternative 1. The impacts of these related actions, in conjunction with the impacts of Alternative 3a, would result in long-term, minor to moderate, beneficial cumulative impacts on employee mobility options; short-term, negligible to minor, adverse cumulative impacts on commuting time; and long-term, moderately beneficial cumulative impacts on visitor experience.

Conclusion

Overall, implementation of Alternative 3a would result in long-term, localized and regional, minor to major, beneficial impacts associated with the additional pathways and transit, and short- and long-term, localized, minor to moderate, adverse impacts on visitor and employee experience. Cumulative impacts would include long-term, negligible to minor, adverse cumulative impacts to employee commuting time; long-term, negligible, beneficial impacts on employee mobility choices; and long-term, moderately beneficial impacts on visitor experience.

Effects of Alternative 4 — Multi-Use Pathways

Visitor Use and Experience

Compared to the No Action Alternative, implementation of Alternative 4 would result in additional long-term, localized and regional, moderate to major, beneficial impacts on visitor experience due to the availability of approximately 42.6 miles (68.4 km) of multi-use pathways outside the road corridor. These improvements would enhance opportunities for safe and enjoyable bicycling in the Park, a moderate to major beneficial impact. Although a relatively small percentage of visitors currently engage in bicycling while visiting the Park, it could be expected that the popularity of this activity would increase because of the new facilities.

The main differences between Alternative 3a and Alternative 4 are as follows: Alternative 4 includes the construction of multi-use pathways outside the road corridor rather than inside the road corridor from North Jenny Lake Junction to Colter Bay, and construction of multi-use pathways outside the road corridor along the entire the Moose-Wilson Road rather than just to the LSR Preserve. In addition, the pathway spurs to String Lake and along Sagebrush Drive and Spring Gulch Road would not be constructed.

Implementation of a limited transit system, pending the results of the TBP, would result in long-term, localized and regional, minor, beneficial impacts by providing a means for visitors to access certain areas of the Park without the need to depend on private automobiles. It is anticipated that this additional service would tend to serve visitors (and employees) having a single or limited number of destinations for the day (or a large portion of a day), rather than as an alternative to pleasure driving or touring the Park. For example, the shuttle service could allow lodge and campground guests to access a trailhead in the Park from which to begin a hike, without having the need for a car. It could also provide a shuttle between various trailheads, making possible circuit hikes that cannot currently be done without having two cars. Transit vehicles would be equipped with bicycle carriers in order to allow visitors to reach certain parts of the pathway system without having to ride the entire distance. Visitors would receive additional information about existing transit in the area that would help with trip planning and would reduce traffic congestion.

Adverse effects on visitor use and experience would result from the construction of multi-use pathways. These new facilities would, to varying degrees, intrude upon the natural landscape and therefore adversely affect the experience of some visitors by increasing the development footprint and thereby altering the character of the road corridor through increased development. Construction of a pathway along the Moose-Wilson Road corridor would noticeably alter the character of the area due to the removal of large numbers of trees in segments of the corridor that are forested, resulting in long-term, localized, minor to moderate, adverse impacts on visitor use and experience. Similar impacts would also occur on forested sections of the Teton Park Road and North Park Road.

Realignment of the Moose-Wilson Road would have short-term, localized, moderate, adverse effects on commuting times and quality of travel experience for both visitors and park personnel; however, these would only be short-term construction-related impacts and would have a long-term, localized, minor to moderate, beneficial impact on transportation and traffic along the Moose-Wilson Road.

As described for Alternative 1, the effect of management strategies on the Moose-Wilson Road would result in both beneficial and adverse impacts on visitor experience, and would vary between different strategies. Overall, most visitors using the Moose-Wilson Road would experience a beneficial impact because traffic levels



would be maintained or reduced. Some visitors could be inconvenienced under some management strategies if they were not able to travel in the direction they desired or reach one of the trailheads without driving around through Jackson. In general, implementation of the various strategies would result in short-term, localized, minor impacts both beneficial and adverse.

Construction of separate entrance lanes and reconfiguration of some parking areas would improve the visitor experience by reducing congestion and waiting times resulting in long term, localized, negligible to minor, beneficial impacts. Beneficial impacts relative to the No Action Alternative would also result from improved traveler information, such as information kiosks, improved way finding, enhanced use of four additional variable messaging signs, and traveler information radio broadcasts. Work to social trails and additional way finding would occur under this alternative improving the visitor experience.

Employee Use and Experience

Under this alternative, a large system of multi-use pathways would be provided along high-use roadways, safer bicycling routes would be available for employees, and social trails would be improved and delineated in several activity areas. The safety, convenience, and quality of travel for employees who bicycle and walk to and from work would be improved. Multi-use pathways would connect Moose to Jackson, Teton Village, Beaver Creek, South Jenny Lake, and points further north. Improvements in pathway systems at activity areas would connect employee housing to the main activity areas within Colter Bay and Signal Mountain Lodge.

If implemented pending the results of the TBP, a pilot transit program could provide service between Jackson and Moose, Jenny Lake, and Colter Bay via the Teton Park Road. Employees with access to vehicles could continue to commute to work by personal vehicle. The pilot transit service could provide a convenient alternative, though with possibly longer commute times. Employees without access to a personal vehicle would experience improved mobility options. Access to work sites and recreation opportunities would be available for almost all employees in the Park.

Short-term construction-related impacts on visitor and employee experience would be expected to consist of short delays on some localized areas of roadways, which would affect visitor access to certain locations, the commute to and from work, and work-related travel within the Park, for some employees. The impact to employee experience would

be negligible to minor and adverse. Construction of separate entrance lanes for employees would reduce the time waiting at the gate resulting in long term, localized, negligible to minor, beneficial impacts. Managing traffic volumes by testing management strategies on the Moose-Wilson Road would have an effect on employee use of the road by reducing the options available for commuting on this route.

Cumulative Impacts

Cumulative impacts on visitor experience would be generally the same as under the other four alternatives. Recent, current, and planned projects within Grand Teton National Park that would influence employee mobility within the Park are the same as for Alternative 1. The impacts of these related actions, in conjunction with the impacts of Alternative 4, would result in long-term, minor to moderate, beneficial impacts on employee mobility options; short-term, negligible to minor, adverse impacts on commuting time; and long-term, moderately beneficial, impacts on visitor experience.

Conclusion

Overall, implementation of Alternative 4 would result in long-term, localized and regional, minor to major, beneficial impacts associated with the additional pathways and transit, and short- and long-term, localized, minor to moderate, adverse impacts on visitor and employee use and experience. Cumulative impacts would include long-term, negligible to minor, adverse impacts to employee commuting time; long-term, negligible, beneficial impacts on employee mobility choices; and long-term, moderately beneficial impacts on visitor experience.

Social and Economic Environment

Methods and Assumptions

This analysis considers effects of the five alternatives on the population, economic activity, housing, community infrastructure, public sector fiscal conditions, local governance, social institutions, and quality of life. The approach to assessing the socioeconomic impacts of the transportation alternatives relies on three factors: (1) existing conditions at Grand Teton National Park in the context of the surrounding socioeconomic environment; (2) the linkages between different elements of the economic and social environment; and (3) the aspects of the transportation alternatives that would trigger changes in the contextual relationships. Given these factors, the direct, indirect, and induced socioeconomic consequences of the transportation-related changes were assessed. The

analysis considers the magnitude or intensity and duration of consequences, as well as the temporal, spatial, and distributional dimensions of their incidence.

The existing economic and social linkages between the Park and Jackson/regional environment are predicated on the Park’s proximity to the community, the relatively limited private land in the area, the geographical relationship between the Park and regional highway network, and the outstanding scenic beauty and rich recreational, historical, and cultural resources of the Park. These factors combined with annual visitation that consistently ranks Grand Teton National Park among the top 10 national parks administered by the NPS, create conditions wherein the Park’s presence plays a substantial role in shaping the local economic and social environment.

A review of the transportation alternatives identified the primary aspects of the alternatives that could trigger socioeconomic impacts. Those events and actions include:

- Construction and related capital expenditures associated with implementation.
- Annual transportation system operating and maintenance expenditures.
- Changes in business opportunities, particularly those of concessioners, associated with transportation-related changes in accessibility.

Beyond the actions identified above, a fundamental assumption of the analysis is that the transportation alternatives would slightly alter the geographical distribution of visitors within the Park or the activity profile of their visits, but the overall level of future visitation would be essentially unaffected or negligibly increase. In light of the assumption regarding visitation, the socioeconomic analysis is relatively straightforward. Quantitative estimates of direct costs and employment serve as the basis for estimating the associated indirect and induced effects using a traditional “economic multiplier” approach. The subsequent incidence of those effects is then determined based on comparisons to changes under the No Action Alternative and professional judgment.

| Impact Threshold Definitions | |
|-------------------------------------|---|
| Negligible | No effects would occur, or the effects to socioeconomic conditions would be below or at the level of detection and with no discernible effect on the character of the social and economic environment. |
| Minor | The effects to socioeconomic conditions would be detectable. Any effects would be small and, if mitigation is needed to offset potential adverse effects, would be simple and successful and not expected to alter the character of the established social and economic environment. |
| Moderate | The effects to socioeconomic conditions would be readily apparent. Any effects would result in changes to socioeconomic conditions on a local scale. If mitigation is needed to offset potential adverse effects, it could be extensive but would likely be successful and could have an appreciable effect on the social and economic environment. |
| Major | The effects to socioeconomic conditions would be readily apparent and would cause substantial changes to socioeconomic conditions in the region. Mitigation measures to offset potential adverse effects would be extensive and their success could not be guaranteed and are likely to have a noticeable influence on the social and economic environment. |
| Duration | Short term — occurs only during the treatment effect/project period. |
| | Long term — occurs after the treatment effect/beyond project period. |
| Area of Analysis | The two-county area encompassing Teton County, Wyoming, and neighboring Teton County, Idaho. |



Effects of Alternative 1 — No Action

Population, Demographics, and Mobility

The underlying economic conditions that have stimulated the region's population growth, high levels of immigration and economic expansion are expected to continue over the foreseeable future. Consequently, long-term population growth would occur under the No Action Alternative.

The resident population of Teton County, Wyoming, is projected to increase to 26,179 by 2010, a 43 percent increase over the year 2000, and the population of Teton County, Idaho, is expected to climb to 6,579, or 14 percent, over the same period (Table 25). Seasonal and visitor populations would also increase.

The strong growth would sustain high levels of net immigration to the region. Teton County, Idaho, would likely see a continuation of the spillover effects of the growth in the Jackson area as some new residents opt to live in Teton County, Idaho, and commute to jobs in neighboring Teton County, Wyoming.

The economic and social influences associated with the Park's presence, its operations and staff, and visitors attracted to the area would continue with no fundamental change. Thus, while the Park would remain an important factor in the socioeconomic landscape, its operations and functioning under Alternative 1 would result in no substantial changes to current conditions in altering that landscape, representing at most an indirect response to slight increases in visitation levels.

| | 2000 | 2005 | 2010 | Changes |
|-----------------------|--------|--------|--------|-------------|
| Teton County, Wyoming | 18,251 | 21,951 | 26,179 | +7,928/+43% |
| Teton County, Idaho | 5,793 | 6,177 | 6,579 | +783/+14% |

Sources: Teton County Housing Authority 2002 and Idaho Commerce and Labor 2005

Cumulative Impacts

Long-term changes in socioeconomic conditions in the region would occur over the next 10 to 20 years. Economic and population growth in the region are driven not so much by discrete and foreseeable activities or events (i.e., the recruitment of a large new employer), but by a series of many smaller, largely independent actions on behalf of individuals, businesses, and governmental

agencies. Together, these actions are expected to increase employment by about 10,000 jobs, result in population growth of 43 percent between 2000 and 2010, spur construction of upwards of 4,000 new dwellings units, and affect local quality-of-life. These changes themselves constitute major long-term changes in regional socioeconomic conditions.

The socioeconomic impacts of Alternative 1, in combination with the major effects from other actions identified above, would result in major cumulative socioeconomic impacts both beneficial and adverse. However, the increment associated with Alternative 1 would be negligible, relative to the overall cumulative socioeconomic impacts.

Conclusion

Alternative 1 would result in long-term, regional, negligible, and slightly beneficial socioeconomic impacts. The economic and social influences associated with the presence of the Park, its operations, staff and the visitors attracted to the area would continue with no fundamental change and there would be no substantial changes in the socioeconomic landscape, representing at most an indirect response to slight increases in visitation levels. Cumulative impacts would be long-term, both beneficial and adverse, and major, with the increment associated with this alternative considered negligible.

Effects of Alternative 2 — Improved Road Shoulders

The transportation system management changes proposed under Alternative 2 would generate a small amount of economic stimulus into the regional economy beyond that associated with the No Action Alternative. The TBP would be developed to determine whether or not it is feasible to begin a transit system in and around Grand Teton National Park. Under this alternative pilot transit could be implemented based on the results of the TBP. The direct stimuli associated with Alternative 2 would be the capital investment of approximately \$13 million (Table 4) to improve road shoulders for use by bicyclists, for development of the TBP, and to add to the information system. Because the specific implementation details would be guided by the TBP it is difficult to estimate the impacts of a transit system in the Park.

Population, Demographics and Mobility

Any temporary impacts due to construction activities involving non-local contractors would be within the scope of such activities that already occur within the regional

economy from time to time during short periods of construction. Implementation of transit could add jobs in the long-term; however, the exact effects are not known. Population changes over the long term under Alternative 2 are estimated at fewer than 20 people. The temporary and long-term population impacts of Alternative 2 are of such a limited scale as to have only a negligible impact. The overall effects would be short- and long-term, regional, negligible to minor, and beneficial.

Cumulative Impacts

The incremental impacts of Alternative 2 would contribute little to long-term cumulative social and economic impacts in the region. Project-related effects, including employment, population and housing demand, would be seasonal in nature and small in magnitude. While the traveling public and residents of the local community would be aware of some of the physical equipment and devices associated with Alternative 2, few would be cognizant of the presence of any additional staff at the Park, or their incomes within the community.

Thus, the impacts of Alternative 2, in combination with the major regional socioeconomic impacts arising from underlying growth trends, would result in major cumulative socioeconomic impacts, both beneficial and adverse. However, the increment associated with Alternative 2 would be negligible in the context of overall cumulative socioeconomic impacts.

Conclusion

Alternative 2 would result in no readily discernible or apparent effect on local economic and social conditions, either temporary or long term. The overall effects would be short- and long-term, regional, negligible to minor, and beneficial. Cumulative impacts would be long-term, major, and both beneficial and adverse, with the increment associated with this alternative considered negligible.

Effects of Alternative 3 — Improved Road Shoulders / Multi-Use Pathways

Under Alternative 3, approximately 23.3 miles (37.3 km) of multi-use pathways would be developed outside the road corridor and shoulders would be improved along 15.5 miles (25.0 km) of roadway. The TBP would be developed to determine whether or not it is feasible to begin a transit system in and around Grand Teton National Park. Under this alternative, pilot transit could be implemented based on the results of the TBP. The pilot transit service and construction activities proposed under Alternative 3 would generate added economic stimulus into the regional

economy beyond that associated with Alternative 1. The direct stimuli associated with Alternative 3 would be a capital investment of approximately \$35 million (Table 4). Because the specific implementation details would be guided by the TBP it is difficult to estimate the impacts of a transit system in the Park.

Population, Demographics and Mobility

The temporary and long-term population impacts of Alternative 3 are comparable to those for Alternative 2, with a slight increase due to construction of the planned pathway system. Demand for housing for temporary workers would increase resulting in a short-term, regional, minor, adverse impact. Those impacts would be minor relative to the current population and the growth anticipated under Alternative 1, and neither inherently beneficial nor adverse in character. Overall, Alternative 3 would have minor economic and social impacts in the region.

Cumulative Impacts

The incremental socioeconomic effects of Alternative 3 represent a small portion of the underlying cumulative trends affecting economics, demographics, and quality-of-life in the region. Thus, the impacts of Alternative 3, in combination with the major regional socioeconomic impacts arising from underlying growth trends, would result in long-term, major cumulative socioeconomic impacts, both beneficial and adverse. However, the increment associated with Alternative 3 would be minor in the context of overall cumulative socioeconomic impacts.

Conclusion

Alternative 3 would result in minor economic and social impacts in the region. The impacts would consist of both direct and indirect elements and tend to be seasonal in nature, with both short-term and long-term dimensions. Impacts on local housing conditions would be minor, but adverse. These impacts would occur against a backdrop of other trends and influences that are likely to continue as the primary agents of change in the region. The overall effects would be short- and long-term, regional, minor, and beneficial and adverse. Cumulative impacts would be long term, major, and both beneficial and adverse, with the increment associated with this alternative considered minor.

Effects of Alternative 3a — Preferred Alternative

The pilot transit service and construction actions proposed under Alternative 3a would generate added economic stimulus into the regional economy beyond that associated



with Alternative 1. The TBP would be developed to determine whether or not it is feasible to begin a transit system in and around Grand Teton National Park. Under this alternative pilot transit could be implemented based on the results of the TBP. The direct stimuli associated with Alternative 3a would be a capital investment of approximately \$45 million (Table 4). Because the specific implementation details would be guided by the TBP it is difficult to estimate the impacts of a transit system in the Park.

The main differences between Alternatives 3 and 3a are as follows: Alternative 3a includes the addition of pathway spurs in two areas (North Jenny Lake Junction to String Lake and along Sagebrush Drive and Spring Gulch Road), and the pathway within the road corridor rather than a widened shoulder from North Jenny Lake Junction to Colter Bay. These differences would result in an increase in cost, particularly in the North Jenny Lake to Colter Bay area, but the increment would not affect socioeconomics at a regional level.

Population, Demographics and Mobility

The temporary and long-term population impacts of Alternative 3a are comparable to those for Alternative 3, with a slight increase due to the more expanded pathway system planned. Demand on housing for temporary workers would increase resulting in a short-term, regional, minor, adverse impact. Those impacts would be minor relative to the current population and the growth anticipated under Alternative 1, and neither inherently beneficial nor adverse in character. Overall, Alternative 3a would result in short- and long-term, regional, minor, beneficial economic and social impacts in the region.

Cumulative Impacts

The incremental socioeconomic effects of Alternative 3a represent a small portion of the underlying cumulative trends affecting economics, demographics, and quality-of-life in the region. Thus, the impacts of Alternative 3a, in combination with the major regional socioeconomic impacts arising from underlying growth trends, result in long-term, major cumulative socioeconomic impacts, both beneficial and adverse. However, the increment associated with Alternative 3a would be negligible in the context of overall cumulative socioeconomic impacts.

Conclusion

Alternative 3a would result in minor economic and social impacts in the region. The impacts would consist of both direct and indirect elements and tend to be seasonal in nature, with both short-term and long-term dimensions.

Impacts on local housing conditions would be minor, but adverse. These impacts would occur against a backdrop of other trends and influences that are likely to continue as the primary agents of change in the region. Overall, Alternative 3a would result in short- and long-term, regional, minor, beneficial and adverse, economic and social impacts in the region. Cumulative impacts would be long term, major, and both beneficial and adverse, with the increment associated with this alternative considered negligible.

Effects of Alternative 4 — Multi-Use Pathways

The pilot transit service and construction actions proposed under Alternative 4 would generate added economic stimulus into the regional economy beyond that associated with Alternative 1. The TBP would be developed to determine whether or not it is feasible to begin a transit system in and around Grand Teton National Park. Under this alternative pilot transit could be implemented based on the results of the TBP. The direct stimuli associated with Alternative 4 would be a capital investment of approximately \$48 million (Table 4). Because the specific implementation details would be guided by the TBP it is difficult to estimate the impacts of a transit system in the Park.

The main differences between Alternative 3a and Alternative 4 are as follows: Alternative 4 includes the construction of multi-use pathways outside the road corridor rather than within the road corridor from North Jenny Lake Junction to Colter Bay, and construction of multi-use pathways outside the road corridor along the entire the Moose-Wilson Road. In addition, the pathway spurs to String Lake and along Sagebrush Drive and Spring Gulch Road would not be constructed.

Population, Demographics and Mobility

The temporary and long-term population impacts of Alternative 4 are comparable to those for Alternatives 3 and 3a, with a slight increase due to the more expanded pathway system planned. Demand on housing for temporary workers would increase, a minor adverse impact. Those impacts would be minor relative to the current population and the growth anticipated under Alternative 1, and neither inherently beneficial nor adverse in character. Overall, Alternative 4 would result in short- and long-term, regional, minor, beneficial economic and social impacts in the region.

Cumulative Impacts

The incremental socioeconomic effects of Alternative 4 represent a small portion of the underlying cumulative trends affecting economics, demographics, and quality-of-life in the region. Thus, the impacts of Alternative 4, in combination with the major regional socioeconomic impacts arising from underlying growth trends, result in long-term, major cumulative socioeconomic impacts, both beneficial and adverse. However, the increment associated with Alternative 4 would be negligible in the context of overall cumulative socioeconomic impacts.

Conclusion

Alternative 4 would result in minor economic and social impacts in the region. The impacts would consist of both direct and indirect elements and tend to be seasonal in nature, with both short-term and long-term dimensions. Impacts on local housing conditions would be minor, but adverse. These impacts would occur against a backdrop of other trends and influences that are likely to continue as the primary agents of change in the region. Overall, Alternative 4 would result in short- and long-term, regional, minor, beneficial and adverse economic and social impacts in the region. Cumulative impacts would be long term, major, and both beneficial and adverse, with the increment associated with this alternative considered negligible.

Local Communities

Methods and Assumptions

This analysis considers opportunities afforded by each of the alternatives to increase collaboration and partnering between the Park and local gateway communities. This Final Plan/EIS offers opportunities for Grand Teton National Park to collaborate with local gateway communities in addressing common transportation problems and issues. For this planning effort, each of the action alternatives has been framed in a slightly different manner to promote future collaboration between the Park and surrounding communities, though measuring the extent of such collaboration is only possible in a qualitative sense.

Alternatives that maximize the ability of local communities (the public and cooperative agencies) to embrace or participate in transportation networking opportunities that promote or maximize the ability of the Park to cooperate and participate with the local community would be favored. Adverse impacts would be actions that would weaken or not maximize the Park’s relationship with the local community. Conversely, beneficial impacts would be actions that strengthen or maximize the relationship of the local community with the Park.

| Impact Threshold Definitions | |
|------------------------------|---|
| Negligible | Changes in local community participation would be below the level of detection. Little noticeable change in opportunities for collaboration. Changes would affect a small proportion of park neighbor(s). |
| Minor | Changes in local community participation would be detectable, although the changes would be slight and likely short term. Detectable changes in collaboration, though highly limited in scope (e.g., a single project in a localized geographic area). Changes would affect a small proportion of park neighbor(s). |
| Moderate | Changes in local community participation would be readily apparent and mostly long term. Readily detectable changes in collaboration, across multiple projects or geographic areas. Changes would affect a moderate proportion of park neighbor(s). |
| Major | Changes in local community participation would be readily apparent and have substantial long-term consequences. Readily apparent changes in collaboration, across virtually all project and geographic areas, and involving substantial financial partnerships and cost sharing. Changes would affect a large proportion of park neighbor(s). |
| Duration | Short term — Effects extend only through the period of one project or event. |
| | Long term — Effects extend beyond the project or event and generally last for the duration of the Final Plan/EIS. |
| Area of Analysis | The developing areas of Teton County, Wyoming, surrounding Grand Teton National Park to the east and south, YNP to the north, and the Teton crest with several small communities on the “Idaho side” (which includes the western-most portions of Teton County, Wyoming, as well as Teton County, Idaho) to the west. |



Effects of Alternative 1 — No Action

Under the No Action Alternative (Alternative 1), the Park could collaborate with town and county partners on future projects. The TBP would be developed but no action would be taken to implement a transit program in the Park. The Park would continue to permit Grand Teton Lodge Company to operate existing levels of transit service in the Park, serving mainly lodge guests, but would not encourage increased visibility for this transit service or any expansion. Finally, it is expected that the Park would respond to the construction of multi-use pathways in Teton County that would approach the south park boundaries on a case-by-case basis.

Several different adaptive management strategies would be tested on the Moose-Wilson Road over the next few years, with the objective of managing traffic volumes to retain the existing character of the road corridor. Under all strategies, two-way traffic would be maintained from Moose to the LSR Preserve and from the Granite Canyon Entrance Station to the Granite Canyon Trailhead. Between the Granite Canyon Trailhead and the LSR Preserve, the NPS may test strategies such as direction of traffic flow or other techniques to manage vehicle use of the road. In any event, the Park would work closely with the local community in order to develop and publicize adaptive management strategies well in advance of their implementation in order to avoid confusion and disruption, and mitigate potential impacts.

The overall level of coordination and integration between the Park and gateway communities would remain modest and focused on individual project opportunities, resulting in a long-term, negligible to minor, beneficial impact on collaboration and partnerships between the Park and its gateway communities. Only a limited number of visitors and local residents would benefit from the collaboration that did exist.

Lifestyle and Social Conditions

Local governments and the community at large would continue their multi-faceted efforts to address a wide spectrum of “quality of life” issues in the face of ongoing growth and development under the No Action Alternative. In addition to housing, those issues include the preservation of open space and scenic vistas, community infrastructure development, preservation of small town values and the area’s western heritage, supporting a socially and economically diverse population, and local public and other transportation needs. Alternative 1 would continue the status quo within the Park regarding transportation

needs, and it would not contribute beneficial or adverse effects on the regional quality of life.

Cumulative Impacts

Cumulative impacts to local communities include the opening of a major new visitor center at Moose and the addition of the LSR Preserve to the Park. Both of these may draw both local residents as well as visitors from out of town. Long-term impacts would be negligible to minor and beneficial.

Development in Teton County, especially around Jackson, Wilson, and Teton Village, is ongoing and private lands have not yet reached maximum build-out. The extent and timing of this build-out is unknown at this time. Projects that have been planned or recently completed could increase both residential and guest activity at the following sites: Four Seasons, Teton Mountain Lodge, Snake River Lodge & Spa, Moose Creek Townhomes, Teton Club, Millward Project (Wyoming Highway 390), and Jackson Hole Golf and Tennis. Together, these projects would add 100 to 140 dwelling units and between 300 and 350 guest units.

Teton County has developed and continues to expand its trail system primarily along existing roads. Among the recently completed and planned projects are:

- **Moose-Wilson Trail:** This project completes a trail for approximately 7.0 miles (11.2 km), from Wyoming Highway 22 to the southwest park boundary along Wyoming Highway 390.
- **Jackson-Moose Scenic Pathway:** This project would complete a trail of approximately 3.5 miles (5.6 km) from Jackson to the Park boundary.
- **Regional Trails:** The following trails are also scheduled for future construction – Teton Pass Millennium Trail (18.0 miles [28.9 km]) from Wilson to Victor; Hoback Junction Pathway (5.7 miles [9.2 km]) from Game Creek to Hoback Junction; Hoback Junction Pathway (5.7 miles [9.2 km]) from Game Creek to Hoback Junction; Wyoming Centennial Scenic Byway – U.S. Highway 26/191 (location unclear); and Wyoming Highway 22 Pathway and Snake River Bridge (95.5 miles [8.8 km]) from the Y-intersection to Wilson.

Long-term impacts would be negligible to minor and beneficial. Overall, impacts of actions described under Alternative 1, combined with impacts of other actions that could affect local communities, would result in long-term, negligible to minor, beneficial cumulative impacts on

inter-jurisdictional collaboration between the Park and surrounding gateway communities.

Conclusion

Alternative 1 would result in a long-term, regional, negligible to minor, beneficial impact on collaboration between the Park and its gateway communities.

Collaboration would continue at a modest and project specific level. Cumulative impacts on local communities would be long term, negligible to minor, and beneficial.

Effects of Alternative 2 — Improved Road Shoulders

Alternative 2 proposes increased publicity of existing transit services to park visitors. The TBP would be developed to determine whether or not it is feasible to begin a transit system in and around Grand Teton National Park. If a pilot transit service were implemented it could include routes between Jackson and Moose, Jenny Lake, and Colter Bay via the Teton Park Road. Transit would provide a means for visitors to access certain areas of the Park without the need to depend on private automobiles. It is anticipated that this additional service would tend to serve visitors (and employees) having a single or limited number of destinations for the day (or a large portion of a day), rather than as an alternative to pleasure driving or touring the Park. For example, the shuttle service could allow lodge and campground guests to access a trailhead in the Park from which to begin a hike, without having the need for a car. It could also provide a shuttle between various trailheads, making possible circuit hikes that cannot currently be done without having two cars. A transit service would be expected to have long-term, regional, negligible to minor, beneficial impacts on coordination between the Park and gateway communities. A small portion of visitors and local residents would be affected by implementation. Transit use would be purely voluntary.

There would be occasional road restrictions on Signal Mountain Road to provided non-motorized users the opportunity to use the roadway at certain times and improve the experience and safety of users. In all other areas of the Park, bicyclists and pedestrians would share the road with vehicular traffic. Selected shoulder improvements would be proposed to connect key destinations or correct measurable public safety hazards along the Teton Park Road. Implementation of this alternative would result in long-term, regional, negligible to minor, beneficial impacts on coordination between the Park and gateway communities.

Finally, Alternative 2 proposes substantial improvements to the Park's traveler information system, including dissemination of real time information to lodge guests; placement of variable messaging signs at key intersections to disseminate information about construction delays, congested areas, accidents, wildlife jams, and similar transportation problems; and improvement of the Park's website. These actions would provide long-term, localized and regional, minor, beneficial impacts for a segment of the local and out-of-area visitor population. Effects from implementation of the various strategies on the Moose-Wilson Road would result in short- and long-term, localized, negligible impacts, both beneficial and adverse, as described for Alternative 1.

Lifestyle and Social Conditions

Alternative 2 would trigger few changes in the local quality of life. Efforts to enhance motorist safety through the improvement of roadway shoulders on the Teton Park Road, and reduce congestion through providing additional travel options, would benefit residents of the region. However, some residents would perceive adverse effects related to temporal road restrictions on Signal Mountain Road and the Moose-Wilson Road. The scale and timing of these impacts would be such that they would be considered minor and indeterminate in character.

Cumulative Impacts

Cumulative impacts to local communities would be similar to those described under Alternative 1. Overall, cumulative actions would result in long-term, negligible, beneficial impacts on inter-jurisdictional collaboration, as a result of the improved shoulders; long-term, minor, beneficial impacts as a result of the traveler information system and possible transit; and long-term, negligible, adverse and beneficial impacts, as a result of roadway management on Signal Mountain Road and the Moose-Wilson Road.

Conclusion

Alternative 2 would result in long-term, regional, minor, beneficial impacts on inter-jurisdictional collaboration, as a result of the improved road shoulders that can be used as bicycling trails connecting to Moose; long-term, localized and regional, negligible to minor, beneficial impacts as a result of the traveler information system and implementation of a transit system (pending the results of the TBP), and short-and long-term, localized, minor, adverse and beneficial impacts as a result of roadway management on Signal Mountain and the Moose-Wilson Roads. Cumulative impacts on local communities would be long term, negligible to minor, and beneficial.



Effects of Alternative 3 — Improved Road Shoulders / Multi-Use Pathways

Alternative 3 proposes increased publicity of existing transit services to park visitors. The TBP would be developed to determine whether or not it is feasible to begin a transit system in and around Grand Teton National Park. If a pilot transit service were implemented it could include routes between Jackson and Moose, Jenny Lake, and Colter Bay via the Teton Park Road. Transit would provide a means for visitors to access certain areas of the Park without the need to depend on private automobiles. It is anticipated that this additional service would tend to serve visitors (and employees) having a single or limited number of destinations for the day (or a large portion of a day), rather than as an alternative to pleasure driving or touring the Park. For example, the shuttle service could allow lodge and campground guests to access a trailhead in the Park from which to begin a hike, without having the need for a car. It could also provide a shuttle between various trailheads, making possible circuit hikes that cannot currently be done without having two cars. A transit service would be expected to have long-term, regional, moderate, beneficial impacts on coordination between the Park and gateway communities. A small portion of visitors and local residents would be affected by implementation. Transit use would be purely voluntary.

Alternative 3 also proposes a system of multi-use pathways and improved road shoulders that would improve the safety and experience of bicyclists and pedestrians. At the south park boundary, a 23.3-mile (37.3-km) pathway outside the road corridor continuing to North Jenny Lake Junction would be designed to interface with the county system, maximizing coordination between facilities. Improved shoulders from North Jenny Lake Junction to Colter Bay (15.5 miles [25.0 km]) would provide a continued link further into the Park.

Likewise, the 3.3-mile (5.3-km) pathway outside the road corridor on a portion of the Moose-Wilson Road would connect with the pathway already constructed along Wyoming Highway 390 by Teton County. Implementation of this alternative would result in long-term, regional, minor to moderate, beneficial impacts on coordination between the Park and gateway communities.

Effects from implementation of the various strategies on the Moose-Wilson Road and improvements to the traveler information system would be the same as described for Alternative 2. Strategies in the AMP could help to reduce traffic on the north section of the road where there would

be mixed use (vehicles and bicyclists) because no pathway is proposed.

Lifestyle and Social Conditions

Alternative 3 could provide a higher level of transit service pending the results of the TBP that would benefit some residents and employees that do not have access to personal vehicles or who favor using transit for personal reasons. Outdoor enthusiasts would also benefit from the increased opportunities to cycle on the expanded pathways network. The net effect of Alternative 3 on the local quality of life would be minor, but indeterminate in character.

Cumulative Impacts

Cumulative impacts under Alternative 3 would be similar to those described under Alternatives 1 and 2, with the addition of multi-use pathways increasing mode choice within the Park. Overall, cumulative impacts to local communities would result in long-term, minor, beneficial cumulative impacts on inter-jurisdictional collaboration if a transit system is implemented and long-term, minor to moderate, beneficial cumulative impacts as a result of the pathway system.

Conclusion

Alternative 3 would result in long-term, regional, moderate, beneficial impacts on inter-jurisdictional collaboration if a transit system is implemented and long-term, regional, minor to moderate, beneficial impacts as a result of the pathway system. Cumulative impacts to local communities would be long-term, minor to moderate, and beneficial.

Effects of Alternative 3a — Preferred Alternative

Alternative 3a proposes increased publicity of existing transit services to park visitors. The TBP would be developed to determine whether or not it is feasible to begin a transit system in and around Grand Teton National Park. Under this alternative pilot transit could be implemented based on the results of the TBP. Because the specific implementation details would be guided by the TBP it is difficult to estimate the impacts of a transit system in the Park. If a pilot transit service were implemented it could include routes between Jackson and Moose, Jenny Lake, and Colter Bay via the Teton Park Road. Transit would provide a means for visitors to access certain areas of the Park without the need to depend on private automobiles. It is anticipated that this additional service would tend to serve visitors (and employees) having a single or limited number of destinations for the day (or a large portion of a day), rather than as an alternative to

pleasure driving or touring the Park. For example, the shuttle service could allow lodge and campground guests to access a trailhead in the Park from which to begin a hike, without having the need for a car. It could also provide a shuttle between various trailheads, making possible circuit hikes that cannot currently be done without having two cars. A transit service would be expected to have long-term, regional, moderate, beneficial impacts on coordination between the Park and gateway communities. A small portion of visitors and local residents would be affected by implementation. Transit use would be purely voluntary.

Alternative 3a also proposes a more expanded system of multi-use pathways that would improve the safety and experience of bicyclists and pedestrians. From the south park boundary, a pathway outside the road corridor to North Jenny Lake Junction and within the road corridor continuing from there to Colter Bay via the Teton Park Road would be designed to interface with the county system, maximizing coordination between facilities. Likewise, the 3.3 mile (5.3 km) pathway within the road corridor on a portion of the Moose-Wilson Road would connect with the pathway already constructed along Wyoming Highway 390 by Teton County.

The main differences between Alternatives 3 and 3a are as follows: Alternative 3a includes the addition of pathway spurs in two areas (North Jenny Lake Junction to String Lake and along Sagebrush Drive and Spring Gulch Road), and the pathway within the road corridor rather than a widened shoulder from North Jenny Lake Junction to Colter Bay. Implementation of Alternative 3a would result in long-term, regional, minor to moderate, beneficial impacts on coordination between the Park and gateway communities.

Effects from implementation of the various strategies on the Moose-Wilson Road and improvements to the traveler information system would be the same as described for Alternative 2. Strategies in the AMP could help to reduce traffic on the north section of the road where there would be mixed use (vehicle and bicyclist) because no pathway is proposed.

Lifestyle and Social Conditions

Alternative 3a could provide a higher level of expanded transit service pending the results of the TBP that would benefit some residents and employees that do not have access to personal vehicles or favor using transit for personal reasons. Outdoor enthusiasts would also benefit from the increased opportunities to cycle on the expanded pathways network. The net effect of Alternative 3a on the

local quality of life would be minor, but indeterminate in character.

Cumulative Impacts

Cumulative impacts under Alternative 3a would be similar to those described under the other alternatives, with the addition of a larger pathway system increasing mode choice within the Park. Overall, cumulative impacts to local communities would result in long-term, minor, beneficial cumulative impacts on inter-jurisdictional collaboration if a transit system is implemented and long-term, minor to moderate, beneficial cumulative impacts as a result of the pathway system.

Conclusion

Alternative 3a would result in long-term, regional, moderate beneficial impacts on inter-jurisdictional collaboration if a transit system is implemented and long-term, regional, minor to moderate, beneficial impacts as a result of the pathway system. Cumulative impacts to local communities would be long-term, minor to moderate, and beneficial.

Effects of Alternative 4 — Multi-Use Pathways

Alternative 4 proposes increased publicity of existing transit services to park visitors. The TBP would be developed to determine whether or not it is feasible to begin a transit system in and around Grand Teton National Park. Under this alternative pilot transit could be implemented based on the results of the TBP. Because the specific implementation details would be guided by the TBP it is difficult to estimate the impacts of a transit system in the Park. If a pilot transit service were implemented it could include routes between Jackson and Moose, Jenny Lake, and Colter Bay via the Teton Park Road.

Transit would provide a means for visitors to access certain areas of the Park without the need to depend on private automobiles. It is anticipated that this additional service would tend to serve visitors (and employees) having a single or limited number of destinations for the day (or a large portion of a day), rather than as an alternative to pleasure driving or touring the Park. For example, the shuttle service could allow lodge and campground guests to access a trailhead in the Park from which to begin a hike, without having the need for a car. It could also provide a shuttle between various trailheads, making possible circuit hikes that cannot currently be done without having two cars. A transit service would be expected to have long-term, regional, moderate, beneficial impacts on coordination



between the Park and gateway communities. A small portion of visitors and local residents would be affected by implementation. Transit use would be purely voluntary.

Alternative 4 would also propose a more expanded system of multi-use pathways that would improve the safety and experience of bicyclists and pedestrians. From the south park boundary, a pathway outside the road corridor all the way to Colter Bay would be designed to interface with the county system, maximizing coordination between facilities. Likewise, the 7.1 mile (11.4 km) pathway outside the road corridor on the entire Moose-Wilson Road would connect with the pathway already constructed along Wyoming Highway 390 by Teton County. This segment of pathway would provide greater connectivity because it would connect with the segments proposed all the way to Colter Bay via Moose or back to the south park boundary.

The main differences between Alternatives 3a and 4 are as follows: Alternative 4 includes the construction of multi-use pathways outside the road corridor rather than within the road corridor from North Jenny Lake Junction to Colter Bay, and construction of multi-use pathways outside the road corridor along the entire the Moose-Wilson Road rather than just to the LSR Preserve. In addition, the pathway spurs to String Lake and along Sagebrush Drive and Spring Gulch Road would not be constructed under Alternative 4. Implementation of this alternative would result in long-term, regional, minor to moderate, beneficial impacts on coordination between the Park and gateway communities.

Effects from implementation of the various strategies on the Moose-Wilson Road and improvements to the traveler information system would be the same as described for Alternative 2.

Lifestyle and Social Conditions

Alternative 4 could provide transit service pending the results of the TBP that would benefit some residents and employees that do not have access to personal vehicles or favor using transit for personal reasons. Outdoor enthusiasts would also benefit from the increased opportunities to cycle on the expanded bike/pathways network. The net effect of Alternative 4 on the local quality of life would be minor, but indeterminate in character.

Cumulative Impacts

Cumulative impacts under Alternative 4 would be similar to those described under the other alternatives, with the addition of a larger pathway system increasing mode choice within the Park. Overall, cumulative actions to local

communities would result in long-term, minor, beneficial cumulative impacts on inter-jurisdictional collaboration if a transit system is implemented and long-term, minor to moderate, beneficial cumulative impacts as a result of the pathway system.

Conclusion

Alternative 4 would result in long-term, regional, moderate, beneficial impacts on inter-jurisdictional collaboration if a transit system is implemented and long-term, regional, minor to moderate, beneficial impacts as a result of the pathway system. Cumulative impacts to local communities would be long-term, minor to moderate, and beneficial.

Park Operations

Methods and Assumptions

For the analysis of impacts to park operations, the principal measure of impact examined is the change in staff required to implement each alternative. The increasing rents and housing prices in the Jackson Hole area, which affect the Park's ability to hire and retain staff, were taken into account when determining the intensity of the impacts.

Estimates were also made of staff requirements for certain key positions that would be affected by implementation of the action alternatives. Park staff familiar with the requirements of these affected positions, including park maintenance, interpretative, and ranger staff, provided input for this analysis. Estimates were made of staff required for oversight and monitoring for proposed roadway improvements, interpretation, enforcement and emergency services for and maintenance of shared use pathways, and administrative support for additional staff. These estimates of staff requirements were compared with staffing under Alternative 1 to derive a measure of impact.

| Impact Threshold Definitions | |
|-------------------------------------|---|
| Negligible | Park operations would not be affected or the effect would be at or below the lower levels of detection, and would not have an appreciable effect on park operations. |
| Minor | The effect would be detectable, but would be of a magnitude that would not have an appreciable effect on park operations. If mitigation was needed to offset adverse effects, it would be relatively simple and likely successful. |
| Moderate | The effects would be readily apparent and would result in a change in park operations in a manner noticeable to staff and the public. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful. |
| Major | The effects would be readily apparent and would result in a change in park operations in a manner noticeable to staff and the public, and would be markedly different from existing operations. Mitigation measures to offset adverse effects would be needed, would be extensive, and their success could not be guaranteed. |
| Duration | Short term — effects lasting for the duration of any construction. |
| | Long term — effects lasting longer than the duration of any construction. |
| Area of Analysis | Within park boundary. |

Effects of Alternative 1 — No Action

Under this alternative, no changes in park operations other than those already planned or anticipated are expected, with the exception of the implementation of several different strategies for managing the Moose-Wilson Road. Visitation would remain at about or slightly above current levels through the life of this plan (5 to 10 years). Implementation of various management strategies for the Moose-Wilson Road would result in minor to moderate workload increases for park staff involved in the planning and coordination of these actions, as well as communicating with area residents and park visitors. The level of park staffing may or may not be adjusted to accommodate changes in operations or visitation, were these to occur. In the event that staff levels did not keep pace with workloads, long-term, localized, negligible to minor, adverse impacts could result.

Cumulative Impacts

Cumulative impacts to park operations would include a number of new facility projects planned, including construction and operation of a new visitor center at Moose, replacement of the Moose Entrance Station, acquisition and operation of the LSR Preserve, and adaptive reuse of the White Grass Ranch as a center for historic preservation work.

Each of these actions requires, to varying degrees, increases in budget and staffing levels. Some, but not all, of these additional operating requirements have already been accounted for in base operating increases, while other portions of the increases would be met or partially met through the help of volunteers and park partner organizations (e.g., Grand Teton Natural History

Association, etc.). Increasing rents and housing prices in Jackson Hole area would decrease the ability of Grand Teton National Park to hire and retain staff. The impacts of these related actions, in conjunction with the impacts of Alternative 1, would result in long-term, minor to moderate, adverse cumulative impacts on park operations.

Conclusion

Alternative 1 would result in long-term, localized, negligible to minor, adverse impacts on park operations, if staffing levels do not keep pace with workloads in the future and because increasing rents and housing prices in the local market would make it difficult to attract and retain employees. Cumulative impacts would be long term, minor to moderate, and adverse.

Effects of Alternative 2 — Improved Road Shoulders

Compared to the No Action Alternative, implementation of Alternative 2 would result in minor increases to the level of park operations. Primarily, these would result from the necessity of ranger staff to manage the recurring opening and closing of Signal Mountain Road during the summer. The addition of improved shoulders would result in a small incremental change in road maintenance activities; however, planning, design, and construction of the shoulders would result in a minor to moderate increase in workload and could result in the deferral of other priority projects. Implementation of various management strategies for the Moose-Wilson Road would result in minor to moderate workload increases for park staff involved in the planning and coordination of these actions, as well as communicating with local communities and park visitors.



Additional information about existing transit service would be provided to park visitors under this alternative and development and implementation of a pilot transit program pending the results of the TBP could result in a moderate increase in workload for park staff. Planning, coordinating, contracting, and other activities associated with introducing a new program into park operations would require the addition of new staff, and the time and attention of existing staff and managers.

Information kiosks and way-finding improvements would require periodic maintenance and would add to existing workloads. The enhanced use of information technology to communicate with visitors would also result in additional operating costs and staffing requirements. Beyond the capital costs of the equipment, operational costs would be incurred for such activities as updating the information content, developing and maintaining an improved website, and maintenance of the equipment. In the event that staff levels did not keep pace with workloads, Alternative 2 could result in long-term, localized, minor, adverse impacts.

Cumulative Impacts

Cumulative impacts under Alternative 2 would be essentially the same as those described under Alternative 1, with additional maintenance required on extended shoulders used by bicyclists and other additional needs described above. Overall, cumulative impacts to park operations would be long term, minor to moderate, and adverse.

Conclusion

Alternative 2 would result in long term, localized, minor, adverse impacts on park operations, because staffing levels to perform current functions would not keep pace with workloads in the future and the added responsibilities of expanded shoulders maintenance and other administrative and communication system functions would add to these responsibilities, possibly requiring still more staff. At the same time, increasing rents and housing prices in the local market would make it difficult to attract and retain employees. Cumulative impacts would be long term, minor to moderate, and adverse.

Effects of Alternative 3 — Improved Road Shoulders / Multi-Use Pathways

The addition of multi-use pathways outside the road corridor along approximately 23.3 miles (37.3 km) of roads and improved road shoulders along 15.5 miles (25.0 km) of roads between North Jenny Lake Junction and Colter Bay

would result in an increased workload for park staff in order to perform routine and cyclic maintenance. Annual maintenance and operation cost increases for these additional pathways is estimated at \$417,000 (see Chapter 2). Routine patrols by park staff would be necessary for a variety of purposes related to managing visitor use, but also in order to identify any developing maintenance issues, especially those that could become safety concerns for bicyclists or other users if not addressed promptly. Planning, design, and construction of the new multi-use pathways would result in an increased workload for park staff, and would likely lead to deferral of other high priority projects.

From the south boundary to North Jenny Lake Junction the effects to park operations from pathway construction outside the road corridor would be minor because the pathway in this area would be visible from the roadway in most instances making routine patrols relatively easy. The 3.3-mile (5.3-km) multi-use pathway outside the road corridor along a portion of the Moose-Wilson Road would be harder to patrol because of the forested vegetation in the area.

Other relevant concerns that have been identified associated with pathway development include impacts to wildlife, impacts to wildlife viewers, and wildlife safety hazards for pathway users. In order to provide mitigation and understand more precisely wildlife associated pathway impacts, the Park would implement a research and monitoring program designed to evaluate a variety of pathway effects, beginning with the first phase of construction. Attributes would be measured before, during, and after pathway construction. The estimated cost for the first 3 years of monitoring and research would be approximately \$700,000, and approximately \$100,000 annually for 3 to 5 years thereafter (see Chapter 2).

Operational activities associated with new facilities and programs would include additional ranger patrols, production of new informational and interpretive materials, control of invasive weeds along pathway corridors, and management and oversight of transit services. The addition of improved shoulders would result in a small incremental change in road maintenance activities; however, planning, design, and construction of the shoulders would result in a minor to moderate increase in workload and could result in the deferral of other priority projects.

Implementation of various management strategies for the Moose-Wilson Road would result in minor to

moderate workload increases for park staff involved in the planning and coordination of these actions, as well as communicating with local communities and park visitors.

Additional information about existing transit service would be provided to park visitors under this alternative and development and implementation of a pilot transit program pending the results of the TBP could result in a moderate increase in workload for park staff. Planning, coordinating, contracting, and other activities associated with introducing a new program into park operations would require the addition of new staff, and the time and attention of existing staff and managers.

Information kiosks and way-finding improvements would require periodic maintenance and would add to existing workloads. The enhanced use of information technology to communicate with visitors would also result in additional operating costs and staffing requirements. Beyond the capital costs of the equipment, operational costs would be incurred for such activities as updating the information content, developing and maintaining an improved website, and maintenance of the equipment.

In addition to the direct impacts on park operations, indirectly any increases in park staffing levels required to support new operations also require a corresponding increase in the need for housing, vehicles, office space, and administrative support. The resulting increase in park staff requirements associated with changes in operations implemented by this alternative would have long-term, localized, moderate, adverse impacts.

Cumulative Impacts

Cumulative impacts under Alternative 3 would be similar to those described under Alternatives 1 and 2, with additional staff and/or responsibilities for current staff from the additional maintenance, enforcement, administrative, and communications functions under Alternative 3. Overall, cumulative impacts to park operations would be long term, moderate, and adverse.

Conclusion

Alternative 3 would result in long-term, localized, moderate, adverse impacts on park operations due to the increased workload necessary to implement and manage the new programs. Increased staffing and funding would be necessary to ensure proper management and maintenance of multi-use pathways, efficient operation of a transit system (if implemented), and a well-coordinated implementation of management strategies for the Moose-Wilson Road that provides timely accurate information

to local communities and park visitors. In addition, the corresponding requirements in housing, vehicles, office space, and administrative support necessary to support additional staff would contribute to the long-term impacts. Short-term impacts on park operations would also be localized, moderate, and adverse due to the workload involved in planning, design, and construction. Cumulative impacts to park operations would be long term, moderate, and adverse.

Effects of Alternative 3a — Preferred Alternative

Under this alternative, a more extensive system of multi-use pathways would be constructed both within and outside of existing road corridors, as described in Chapter 2. The addition of approximately 41.3 miles (66.3 km) of multi-use pathways would result in an increased workload for park staff in order to perform routine and cyclic maintenance. Annual maintenance and operation costs for these pathways are estimated at \$558,000 (see Chapter 2). Routine patrols by park staff would be necessary for a variety of purposes related to managing visitor use, but also in order to identify any developing maintenance issues, especially those that could become safety concerns for bicyclists or other users if not addressed promptly. Planning, design, and construction of the new multi-use pathways would result in an increased workload for park staff, and would likely lead to deferral of other high priority projects.

From the south boundary to North Jenny Lake Junction, the effects to park operations from pathway construction outside the road corridor would be minor because the pathway in this area would be visible from the roadway in most instances making routine patrols relatively easy. The segments along the Moose-Wilson Road and from North Jenny Lake Junction to Colter Bay would also be relatively easy to patrol because of their proximity to the road. However, the labor and maintenance of these latter two segments would result in long-term, localized, moderate to major, adverse impacts to park operations.

Other relevant concerns that have been identified associated with pathway development include impacts to wildlife, impacts to wildlife viewers, and wildlife safety hazards for pathway users. In order to provide mitigation and understand more precisely wildlife associated pathway impacts, the Park would implement a research and monitoring program designed to evaluate a variety of pathway effects, beginning with the first phase of construction. Attributes may be measured before, during,



and after pathway construction. The estimated cost for the first 3 years of monitoring and research would be approximately \$700,000, and approximately \$100,000 annually for 3 to 5 years thereafter (see Chapter 2).

Operational activities associated with new facilities and programs would include additional ranger patrols, production of new informational and interpretive materials, control of invasive weeds along pathway corridors, and management and oversight of transit services.

Implementation of various management strategies for the Moose-Wilson Road would result in minor to moderate workload increases for park staff involved in the planning and coordination of these actions, as well as adequate communication with local communities and park visitors.

Additional information about existing transit service would be provided to park visitors under this alternative; development and implementation of a pilot transit program pending the results of the TBP could result in a moderate increase in workload for park staff. Planning, coordinating, contracting, and other activities associated with introducing a new program into park operations would require the addition of new staff, as well as the time and attention of existing staff and managers.

Information kiosks and way-finding improvements would require periodic maintenance and would add to existing workloads. The enhanced use of information technology to communicate with visitors would also result in additional operating costs and staffing requirements. Beyond the capital costs of the equipment, operational costs would be incurred for such activities as updating the information content, developing and maintaining an improved website, and maintenance of the equipment.

In addition to the direct impacts on park operations, indirectly any increases in park staffing levels required to support new operations also require a corresponding increase in the need for housing, vehicles, office space, and administrative support. The resulting increase in park staff requirements associated with changes in operations implemented by this alternative would have long-term, localized, moderate to major, adverse impacts.

Cumulative Impacts

Cumulative impacts under Alternative 3a would be similar to those described under the previous alternatives; however, the additional staff and/or responsibilities for current staff from the additional maintenance, enforcement, administrative, and communications

functions under Alternative 3a would add to adverse impacts. Overall, cumulative impacts to park operations would be long term, moderate to major, and adverse.

Conclusion

Alternative 3a would result in long-term, localized, moderate to major, adverse impacts on park operations due to the increased workload necessary to implement and manage the new programs. Increased staffing and funding would be necessary to ensure proper management and maintenance of multi-use pathways, efficient operation of a transit system (if implemented), and a well-coordinated implementation of management strategies for the Moose-Wilson Road that provides timely accurate information to local communities and park visitors. In addition, the corresponding requirements in housing, vehicles, office space, and administrative support necessary to support additional staff would contribute to the long-term impacts. Short-term impacts on park operations would be localized, moderate, and adverse due to the workload involved in planning, design, and construction. Cumulative impacts would be long term, moderate to major, and adverse.

Effects of Alternative 4 — Multi-Use Pathways

Under this alternative, a network of multi-use pathways outside the road corridor would be added along the high use roadways in the Park. The development of approximately 42.6 miles (68.4 km) of multi-use pathways would result in an increased workload for park staff in order to perform routine and cyclic maintenance. Annual maintenance and operation costs for these pathways is estimated at \$558,000 (see Chapter 2). Routine patrols by park staff would be necessary for a variety of purposes related to managing visitor use, but also in order to identify any developing maintenance issues, especially those that could become safety concerns for bicyclists or other users if not addressed promptly. Planning, design, and construction of the new multi-use pathways would result in an increased workload for park staff, and would likely lead to deferral of other high priority projects.

From the south boundary to North Jenny Lake Junction the effects to park operations from pathway construction would be minor because the pathway in this area would be visible from the roadway in most instances making routine patrols relatively easy. The segments along the Moose-Wilson Road and from North Jenny Lake Junction to Colter Bay would be more difficult to patrol because portions of the pathways would be less visible from the road because of intervening topography, trees, and other

vegetation. The labor to construct the segment from North Jenny Lake Junction to Colter Bay would be less intensive than construction proposed under Alternative 3a because construction would not occur within the road corridor.

Other relevant concerns that have been identified associated with pathway development include impacts to wildlife, impacts to wildlife viewers, and wildlife safety hazards for pathway users. In order to provide mitigation and understand more precisely wildlife associated pathway impacts, the Park would implement a research and monitoring program designed to evaluate a variety of pathway effects, beginning with the first phase of construction. Attributes may be measured before, during, and after pathway construction. The estimated cost for the first 3 years of monitoring and research would be approximately \$700,000, and approximately \$100,000 annually for 3 to 5 years thereafter (see Chapter 2).

Operational activities associated with new facilities and programs would include additional ranger patrols, production of new informational and interpretive materials, control of invasive weeds along pathway corridors, and management and oversight of transit services.

Implementation of various management strategies for the Moose-Wilson Road would result in minor to moderate workload increases for park staff involved in the planning and coordination of these actions, as well as adequate communication with local communities and park visitors.

Additional information about existing transit service would be provided to park visitors under this alternative; development and implementation of a pilot transit program pending the results of the TBP could result in a moderate increase in workload for park staff. Planning, coordinating, contracting, and other activities associated with introducing a new program into park operations would require the addition of new staff, as well as the time and attention of existing staff and managers.

Information kiosks and way-finding improvements would require periodic maintenance and would add to existing workloads. The enhanced use of information technology to communicate with visitors would also result in additional operating costs and staffing requirements. Beyond the capital costs of the equipment, operational costs would be incurred for such activities as updating the information content, developing and maintaining an improved website, and maintenance of the equipment.

In addition to the direct impacts on park operations, indirectly any increases in park staffing levels required to support new operations also require a corresponding increase in the need for housing, vehicles, office space, and administrative support. The resulting increase in park staff requirements associated with changes in operations implemented by this alternative would have long-term, localized, moderate to major, adverse impacts.

Cumulative Impacts

Cumulative impacts under Alternative 4 would be similar to those described under the previous alternatives; however, the additional staff and/or responsibilities for current staff from the additional maintenance, enforcement, administrative, and communications functions under Alternative 4 would add to adverse impacts. Overall, cumulative impacts to park operations would be long term, moderate to major, and adverse.

Conclusion

Alternative 4 would result in long-term, localized, moderate to major, adverse impacts on park operations due to the increased workload necessary to implement and manage the new programs. Increased staffing and funding would be necessary to ensure proper management and maintenance of multi-use pathways, efficient operation of a transit system (if implemented), and a well-coordinated implementation of management strategies for the Moose-Wilson Road that provides timely accurate information to local communities and park visitors. In addition, the corresponding requirements in housing, vehicles, office space, and administrative support necessary to support additional staff would contribute to the long-term impacts. Short-term impacts on park operations would also be moderate and adverse due to the workload involved in planning, design, and construction. Cumulative impacts would be long term, moderate to major, and adverse.

Unavoidable Adverse Impacts

The following discussion identifies impacts to resources associated with the implementation of each alternative. These impacts have been identified as being unavoidable, moderate or major, and adverse. The EIS used the best available information to estimate environmental impacts; conservative assumptions were made to estimate effects where information was unavailable. The Park would follow mitigation measures and conservation measures outlined in Appendix A of this Final Plan/EIS to minimize potential effects to resources.



Alternative 1 — No Action

Threatened and Endangered Species — Grizzly Bear and Gray Wolf

Alternative 1 is likely to adversely affect the grizzly bear and gray wolf because vehicle collisions may occur that would adversely affect one or more individuals; however, the alternative would not threaten the survival of either species. A moderate adverse impact results from the potential take of an individual bear or wolf due to vehicle collision or (for bears) acclimation to human presence.

Visitor and Employee Experience

Implementation of Alternative 1 would result in short- and long-term, localized, minor to moderate, adverse impacts on visitor and employee experience. Moderate adverse impacts would result from the inconveniences related to the construction and maintenance and the potential continued parking demand.

Alternative 2 — Improved Road Shoulders

Threatened and Endangered Species — Grizzly Bear and Gray Wolf

Alternative 2 is likely to adversely affect the grizzly bear and gray wolf because vehicle collisions may occur that would adversely affect one or more individuals; however, the alternative would not threaten the survival of either species. A moderate adverse impact results from the potential take of an individual bear or wolf due to vehicle collision or (for bears) acclimation to human presence.

Visual Quality

Short-term, localized, moderate, adverse impacts would result during construction of new road shoulders and facilities.

Visitor and Employee Experience

Implementation of Alternative 2 would result in short-term, localized, negligible to moderate, adverse impacts on visitor and employee experiences. Moderate adverse impacts would result from the inconveniences related to the construction of the road shoulders and the potential continued parking demand.

Alternative 3 — Improved Road Shoulders / Multi-Use Pathways

Threatened and Endangered Species — Grizzly Bear and Gray Wolf

Alternative 3 is likely to adversely affect the grizzly bear and gray wolf because vehicle collisions may occur that would adversely affect one or more individuals; however, the alternative would not threaten the survival of either species. A moderate adverse impact results from the potential take

of an individual bear or wolf due to vehicle collision or (for bears) acclimation to human presence.

Visual Quality

Alternative 3 would result in long-term, localized, minor to moderate, adverse impacts on visual quality, primarily because of the introduction of multi-use pathways into the foreground views, as seen from the affected road corridors. Short-term, localized, moderate, adverse impacts would result during realignment and construction of improved shoulders and pathways.

Soils

Alternative 3 would result in long-term, localized, minor to moderate, adverse impacts to soils, because of the construction of a multi-use pathway system and improved road shoulders.

Vegetation

Actions under Alternative 3 would result in long-term, localized, moderate, adverse impacts on vegetation chiefly because of the construction of the pathway system. Widening road shoulders would result in long-term, localized, minor to moderate, adverse impacts on plant communities, especially in wetland and heavily forested areas. In the short-term, localized, moderate, adverse impacts would occur where construction disturbs vegetation, including the realignment of two sections of the Moose-Wilson Road.

Transportation System and Traffic

Under Alternative 3, long-term, localized, minor, adverse impacts would continue to affect some parking areas due to crowding at certain times, and selected parking areas would experience long-term, localized, minor to moderate, adverse impacts because of new parking demand associated with use of the pathway system.

Visitor and Employee Experience

Implementation of Alternative 3 would result in short- and long-term, localized, negligible to moderate, adverse impacts on visitor and employee experience associated with the change to the landscape and inconveniences related to the construction of the road shoulders and pathways, and the potential increase in parking demand.

Park Operations

Alternative 3 would result in long-term, localized, moderate, adverse impacts on park operations due to the increased workload necessary to implement and manage the new programs. Increased staffing and funding would be necessary to ensure proper management and

maintenance of multi-use pathways, efficient operation of a transit system (if implemented), and a well-coordinated implementation of management strategies for the Moose-Wilson Road that provides timely accurate information to local communities and park visitors. In addition, the corresponding requirements in housing, vehicles, office space, and administrative support necessary to support additional staff would contribute to the long-term impacts. Short-term impacts on park operations would be localized, moderate, and adverse due to the workload involved in planning, design, and construction.

Alternative 3a — Preferred Alternative

Threatened and Endangered Species — Grizzly Bear and Gray Wolf

Alternative 3a is likely to adversely affect the grizzly bear and gray wolf because vehicle collisions may occur that would adversely affect one or more individuals; however, the alternative would not threaten the survival of either species. A moderate adverse impact results from the potential take of an individual bear or wolf due to vehicle collision or (for bears) acclimation to human presence.

Visual Quality

Alternative 3a would result in long-term, localized, moderate, adverse impacts on visual quality, largely because of the introduction of multi-use pathways into the foreground views, as seen from the affected road corridors. This would be particularly true in the Moose-Wilson corridor and from North Jenny Lake Junction to Colter Bay where pathways would be constructed within the road corridor. Short-term, localized, moderate, adverse impacts would result during construction including the realignment of two sections of the Moose-Wilson Road.

Soils

Alternative 3a would result in short- and long-term, localized, moderate, adverse impacts to soils primarily because of the construction of a multi-use pathway system.

Vegetation

Actions under Alternative 3a would result in long-term, localized, moderate, adverse impacts on vegetation chiefly because of the construction of the pathway system. Approximately 22.5 miles (36.0 km) of multi-use pathways would be located in relatively undisturbed areas outside the road corridor. Construction of 18.8 miles (30.3 km) of multi-use pathways within the road corridor would result in minor to moderate alteration of plant communities, especially in wetland areas and in heavily forested areas. In the short-term, moderate adverse impacts would occur

where construction disturbs vegetation, including the realignment of two sections of the Moose-Wilson Road.

Wetlands

Alternative 3a would result in long-term, localized, minor to moderate, adverse impacts to wetlands, mainly in the vicinity of Cottonwood Creek and the area from Jackson Lake Dam to Jackson Lake Junction. Approximately 3.85 acres (1.56 ha) of wetlands could be impacted under this alternative.

Wildlife

Although no adverse population level impacts are anticipated from Alternative 3a, effects to local species distributions and habitat use patterns are likely and would be long-term, localized, negligible to moderate, and adverse.

Although direct habitat impacts on mammals, reptiles, and amphibians would be relatively small, the increased disturbance (both spatially and in terms of recreation use levels) would further fragment habitats and erode habitat effectiveness. The addition of multi-use pathways, particularly along the Moose-Wilson corridor, but also between Jackson Lake Junction and Colter Bay, would affect some of the Park's most diverse and productive habitats. The potential for human-wildlife conflicts and associated management actions would be greater under this alternative than under Alternatives 1, 2, or 3 due to the larger area affected by the proposed pathways and the diverse habitats they traverse (i.e., greater number of species and individuals affected). Direct mortality levels are not expected to increase under this alternative; however, it is likely that vehicles using park roads would continue to strike and kill individual mammals. Although no adverse population level impacts are anticipated, effects to local species distributions and habitat use patterns are likely and would be long-term, localized, negligible to moderate, and adverse.

Transportation System and Traffic

Selected parking areas would experience long-term, localized, minor to moderate, adverse impacts because of new parking demand associated with use of the pathway system proposed under Alternative 3a.

Visitor and Employee Experience

Implementation of Alternative 3a would result in long-term, localized, minor to moderate, adverse impacts on visitor and employee experience. Moderate adverse impacts would result from the inconveniences related to the construction of the pathways and the potential increase in parking demand.



Park Operations

Alternative 3a would result in long-term, localized, moderate, adverse impacts on park operations due to the increased workload necessary to implement and manage the new programs. Increased staffing and funding would be necessary to ensure proper management and maintenance of multi-use pathways, efficient operation of a transit system (if implemented), and a well-coordinated implementation of management strategies for the Moose-Wilson Road that provides timely accurate information to local communities and park visitors. In addition, the corresponding requirements in housing, vehicles, office space, and administrative support necessary to support additional staff would contribute to the long-term impacts. Short-term impacts on park operations would be localized, moderate, and adverse due to the workload involved in planning, design, and construction.

Alternative 4 — Multi-Use Pathways

Threatened and Endangered Species — Grizzly Bear and Gray Wolf

Alternative 4 is likely to adversely affect the grizzly bear and gray wolf because vehicle collisions may occur that would adversely affect one or more individuals; however, the alternative would not threaten the survival of either species. A moderate adverse impact results from the potential take of an individual bear or wolf due to vehicle collision or (for bears) acclimation to human presence.

Visual Quality

Alternative 4 would result in long-term, localized, moderate, adverse impacts on visual quality, largely because of the introduction of multi-use pathways into the foreground views, as seen from the affected road corridors. Short-term, localized, minor, adverse impacts would result during construction.

Soils

Alternative 4 would result in long-term, localized, moderate, adverse impacts to soils primarily because of the construction of a multi-use pathways system.

Vegetation

Actions under Alternative 4 would result in long-term, localized, moderate, adverse impacts on vegetation chiefly because of the construction of the pathway system. New pathways would be located in relatively undisturbed areas outside the road corridor. In the short-term, localized, moderate, adverse impacts would occur where construction disturbs vegetation, including the realignment of two sections of the Moose-Wilson Road.

Hydrology and Water Quality

Alternative 4 would result in long-term, localized, minor to moderate, adverse impacts on water quality, principally due to the construction of separate bridges over Christian and Pilgrim Creeks; the increase in impervious surface associated with pathway facilities; and the potential for storm runoff from these facilities to carry pollutants (fuels, oil) into the groundwater.

Wetlands

Alternative 4 would result in long-term, localized, minor to moderate, adverse impacts to wetlands, mainly in the vicinity of Cottonwood Creek and the area from Jackson Lake Dam to Jackson Lake Junction. Approximately 4.26 acres (1.72 ha) of wetlands would be impacted under this alternative.

Wildlife

Alternative 4 would have the highest level of adverse impacts on wildlife of the alternatives considered. Although direct habitat impacts on mammals, reptiles, and amphibians would be relatively small, the increased disturbance (both spatially and in terms of recreation use levels) would further fragment habitats and erode habitat effectiveness. These impacts would be greater than any other alternative considered because of a greater area of impact caused by more linear feet of multi-use pathways outside of the roadway corridor. The addition of multi-use pathways outside of the roadway corridor, particularly along the Moose-Wilson corridor, but also between Jackson Lake Junction and Colter Bay, would affect some of the Park's most diverse and productive habitats. The potential for human-wildlife conflicts and associated management actions would be greatest under this alternative due to the larger area affected by the proposed pathways and the diverse habitats they traverse (i.e., greater number of species and individuals affected). Although no adverse population level impacts are anticipated, effects to local species distributions and habitat use patterns are likely and would be long-term, localized, negligible to moderate, and adverse.

Transportation System and Traffic

Selected parking areas would experience long-term, localized, minor to moderate, adverse impacts because of new parking demand associated with use of the pathway system proposed under Alternative 4.

Visitor and Employee Experience

Implementation of Alternative 4 would result in long-term, localized, minor to moderate, adverse impacts on visitor

and employee experience. Moderate adverse impacts would result from the inconveniences related to the construction of the pathways and the potential increase in parking demand. This impact would be expected to be less than under Alternative 3a.

Park Operations

Alternative 4 would result in long-term, localized, moderate to major, adverse impacts on park operations due to the increased workload necessary to implement and manage the new programs. Increased staffing and funding would be necessary to ensure proper management and maintenance of multi-use pathways, efficient operation of a transit system (if implemented), and a well-coordinated implementation of management strategies for the Moose-Wilson Road that provides timely accurate information to local communities and park visitors. In addition, the corresponding requirements in housing, vehicles, office space, and administrative support necessary to support additional staff would contribute to the long-term impacts. Short-term impacts on park operations would be localized, moderate, and adverse due to the workload involved in planning, design, and construction.

Irreversible or Irrecoverable Commitments of Resources

An irreversible commitment of resources is defined as the loss of future options. The term applies primarily to the effects of using nonrenewable resources, such as minerals or cultural resources, or to the loss of an experience as an indirect effect of a permanent change in the nature or character of the land.

An irretrievable commitment of resources is defined as the loss of production, harvest, or use of natural resources. The amount of production foregone is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume production.

The irretrievable and irreversible commitments of resources that are associated with each alternative are summarized below. Irreversible commitments are those that cannot be reversed, except perhaps in the extreme long term. Irrecoverable commitments are those that are lost for a period of time.

Alternative 1 — No Action

The irretrievable and irreversible commitments of resources associated with Alternative 1 are mainly limited to the consumption of energy resources, because no specific actions would be taken to change any of the

natural or cultural resources, visitor experience, or park operations.

Alternatives 2, 3, 3a, and 4

Irretrievably and irreversibly committed resources are those that are consumed during the construction and implementation of a project and that cannot be reused. Because their reuse is impossible, they are considered irretrievably and irreversibly committed to the development of the proposed project. These resources would include expendable materials necessary for construction, as well as fuels and other forms of energy that are utilized during project implementation.

During construction, non-renewable resources would be consumed. Because the reuse of these resources may not be possible, they could be considered irreversibly and irretrievably committed should the proposed actions be implemented. The non-renewable resources would include materials such as materials and fuel used during construction.

Under these alternatives, no appreciable irreversible or irretrievable commitments of resources would be associated with water resources, air quality, visual and scenic resources, noise, visitor experience, transportation, social and economic environments, or park operations. If any wetlands, soils, or roadside vegetation were impacted during construction, this would be an irretrievable commitment of this resource for at least the duration of the alternative. However, it would be possible to rehabilitate impacted areas and return them to their preconstruction state at some point in the future.

The Relationship between Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity

This section considers the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity.

Alternative 1 — No Action

No measurable change from current conditions is expected. Visitation levels would continue to grow slightly. The existing relationship of short-term uses of the environment and the maintenance and enhancement of long-term productivity would be expected to continue with future potential issues addressed through the Park planning process.



Alternatives 2, 3, 3a, and 4

Both short- and long-term commitments of labor and capital, along with use of non-renewable materials, would result from the construction and use of the proposed pathways and/or improved shoulders. The construction activities associated with these alternatives are short term and temporary and adherence to the proposed mitigation measures (Appendix A) would minimize both short- and long-term effects. Long term monitoring would improve knowledge of the effects of use of the pathways system and would inform planning and design of future segments. The activities under each alternative affect the availability of land resources after the implementation phase, but no significant losses in long-term productivity have been identified as a result of the project alternatives.

