

Environmental Consequences

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Derivation of Impact Topics

IMPACT TOPICS CONSIDERED

To focus the discussion of potential consequences of the alternatives and the management strategy, specific impacts topics were selected based on (1) federal laws, regulations, and executive orders, (2) NPS Management Policies, (3) knowledge of resources, (4) resource studies, and (5) concerns expressed by the public, including special interest groups, the Blackfeet and Confederated Salish-Kootenai Tribes, and other agencies during scoping and throughout the development of this General Management Plan. A brief rationale for selecting each major impact topic is discussed below. The impacts of the alternatives have been grouped by placing all the impacts of the no-action alternatives together, all the impacts of the preferred alternatives together, and all the impacts of the other alternatives together. The effects of the management strategy are also analyzed.

Water Resources. Executive Orders 11990 and 11988 require the examinations of the impacts on wetlands and floodplains. Since the headwater drainages for the Columbia River, the Missouri River, and the Saskatchewan River, which terminates at Hudson Bay, are all in the park, pristine water quality is of concern not only to the National Park Service but to those downstream. Water quality and floodplains and wetlands are important resources in Glacier National Park, and actions in the park that affect these resources could have downstream effects as well.

Scenic Resources. A fundamental park purpose, according to the NPS Organic Act, is to conserve the scenery. The purpose and significance statements that were developed for Glacier National Park recognize the value of the scenic resources. The scenes include the views into the park from the outside and views out of the park from the interior. It is important to understand the effects the alternatives might have on these resources.

Air Quality. Glacier National Park is a class I air quality area. The Clean Air Act requires federal land managers to protect park air quality and air-quality related values. The potential impacts on air quality are analyzed.

Soils. Soils are important resources because they support plant and wildlife habitat. Proposed development and visitor activity would affect soils.

Vegetation, Including State-Rare Plant Species. The NPS Organic Act directs that the National Park Service protect and conserve the natural resources

in the park. The purpose and significance statements that were developed recognize the value of the vegetation and the five floristic provinces in the park. Vegetation communities, federally listed species at risk, and state-rare plant species were identified as important resources that could be threatened by increasing visitor use and development. There are three species at risk and an additional 45 state-rare plant species in the park. There are no known federally listed threatened or endangered plant species in the park.

Wildlife, Including Federally Listed Threatened and Endangered and State-rare Wildlife Species. The NPS Organic Act directed the protection and conservation of natural resources in the park. The purpose and significance statements also recognize the value of wildlife. Wildlife habitat, federally listed wildlife species, and species considered to be rare in the state are important and could be threatened by increasing visitor use and development. There are four federally listed threatened or endangered wildlife species in the park (wolves, peregrine falcons, grizzly bears, bald eagles). Lynx are expected to be listed soon.

Aquatic resources, including federally listed threatened or endangered and state-rare species. The NPS Organic Act directed the protection and conservation of natural resources in the park. There is one aquatic species listed as threatened (bull trout), one proposed species (capshell limpet), and one state-rare species (westslope cutthroat trout).

Natural Sound. Natural sound and the opportunities to experience solitude are valued resources in Glacier National Park and were frequently mentioned during scoping. Concerns were expressed about the effects of scenic air tours and personal watercraft.

Biological Diversity. NPS Management Policies lists a requirement for protection of biological diversity in NPS areas.

Cultural Resources, Including Archeological Resources, National Register Properties, National Historic Landmarks, National Historic Districts, and Other Sites of Cultural Significance. Glacier has a significant cultural record that dates from prehistoric times. The NPS Organic Act, sections 106 and 110 of the National Historic Preservation Act and sections of NPS Management Policies require that the effects on cultural resources from NPS actions be evaluated. The purpose and significance statements also recognize the value of cultural resources in the park. Actions related to development and visitor use have the potential to affect cultural resources. Glacier has six national historic landmarks and more than 350 properties listed on the national register.

American Indians. Concerns were expressed during scoping about the rights of the Blackfeet and the Confederated Salish and Kootenai Tribes in the park.

Regional and Local Economies. Glacier National Park contributes to the local and state economies in various ways, including tourism, employee, and operational expenditures. The alternatives are analyzed for their effects on regional and local communities.

Local and National Visitors. National visitors comprise 87 percent of the visitors to Glacier and local residents comprise 13 percent. The alternatives are

analyzed for their effects on visitor experiences for both local and national visitors. Concerns were expressed about congestion.

Private Land Inside the Boundary. There are 418.68 acres of private land inside the boundary of Glacier National Park. And there is private land adjacent to the park on the east and west sides, in the North Fork, and south and west of the boundary. The alternatives were analyzed for their effects on the owners of that land.

Energy Consumption. The National Environmental Policy Act requires a discussion of the energy requirements of each of the alternatives.

Environmental Justice. In accordance with Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, the National Park Service is required to analyze the impacts of park actions on minority populations.

IMPACT TOPICS DISMISSED FROM FURTHER ANALYSIS

Impacts on Prime and Unique Farmlands. There are no prime and unique farmlands as defined by the Natural Resource Conservation Service inside the park boundary; thus there would be no impacts on these lands (Dutton, pers. com. 1997).

Impacts on Federally Listed Threatened or Endangered Plants. There are no known federally listed threatened or endangered plant species in the park. Not all areas in the park have been surveyed, and some areas chosen for development would have to be surveyed before the completion of the design phase to meet the requirements of section 7 of the Endangered Species Act.

Impacts of All No-Action Alternatives

IMPACTS ON THE NATURAL ENVIRONMENT

Impacts on Water Resources, Including Water Quality, Floodplains and Wetlands

Methods for Analyzing Impacts. In cooperation with the U.S. Fish and Wildlife Service, the park staff completed a national wetlands survey of the park in 1993. Floodplain information was gathered from reports by the U.S. Army Corps of Engineers. All available reports were also consulted (see Bibliography). The park staff monitors drinking water in all developed areas on varying schedules as required by the state of Montana and in accordance with the Clean Water Act. Chlorine levels are measured daily, the presence of bacteria is measured monthly, and yearly chemical analyses are done to measure a variety of elements such as nitrates, volatile organics and inorganics, lead, copper, and synthetics. Relevant published literature concerning the impacts of personal watercraft was reviewed, and other parks and recreational areas that have assessed PWC impacts were consulted.

Existing Management Zoning. There would be no additional adverse effects on water resources and wetlands as a result of continuing management zoning as described in the 1977 *Master Plan* because no management actions would be taken as a result of zoning. Wilderness values would not be affected.

Visitor Use on the Going-to-the-Sun Road — Water quality of the creeks and streams adjacent to the Going-to-the-Sun Road might be affected by increasing visitor use. Visitors who pull off the road in undesignated areas could cause a direct adverse impact on water quality through gradual erosion resulting in sediment entering creeks and rivers along the road. There would be no impact on floodplains and wetlands.

Preservation of the Going-to-the-Sun Road — The Going-to-the-Sun Road bisects or parallels dozens of watercourses along the 30 miles that would be reconstructed over the next 50 years. Some, like McDonald, Reynolds, and Logan Creeks, are perennial; many others are intermittent or ephemeral and flow in response to snowmelt or summer thunderstorms. The road is also situated within

the historic floodplain of several streams (including Avalanche Creek) and is located alongside several wetland areas (McDonald Creek and St. Mary River). The potential to impact water quality during the reconstruction process is a concern. Without mitigation to protect streams and rivers adjacent to the Going-to-the-Sun Road, water quality would be adversely affected by increased sediment and turbidity. Potential impacts include the flushing of blasting residue (nitrate salts, ammonia, and hydrocarbons) into streams and rivers. With mitigation in place, water quality would be protected from adverse effects. Mitigation would include sediment barriers, diversion of overland flow away from the construction site, timing of construction during low flow periods, and prompt revegetation after reconstruction. In cases where construction disturbs park streams (such as replacing culverts) measures would be taken to limit the amount of slumping and erosion. Side streams might be temporarily routed past the construction area. Any turbid water would be collected and allowed to settle before being replaced in the stream. Culverts would be designed to allow for fish passage when appropriate. Prior to any road construction project, an Army Corps of Engineers 404 permit (as defined by the Clean Water Act) and state permits would be obtained. These permits define the activity to take place and the required mitigation to protect water quality.

Preservation of Historic Hotels and Visitor Services — There would be no adverse impacts on water quality or floodplains and wetlands as a result of the no-action alternative for cultural heritage and visitor services because there would be no additional ground disturbance.

Scenic Air Tours — There would be no adverse impacts on water quality or floodplains and wetlands as a result of the no-action alternative for scenic air tours because there would be no surface disturbance. The aircraft cannot land in the park.

Personal Watercraft — The use of personal watercraft on St. Mary and Sherburne Lakes and Lake McDonald could adversely impact water quality through the release of petroleum products into the water, depending on the amount of use. Virtually all personal watercraft are powered by two-stroke engines (not fuel-injected) that lose about 30 percent of their unburned fuel and oil mix directly into the air and water (Tahoe Research Group 1997). The PWC industry has begun phasing out 2-stroke units, but the phaseout could take 25 years or more.

Research results are inconclusive regarding what happens to the unburned fuel emitted into air and water. Several studies suggest that as much as 50 percent evaporates immediately and an additional 30-40 percent evaporates within eight hours. Because of the number of uncontrollable variables, such as the degree of sunlight, it is difficult to determine the exact percentage. A recent Michigan State University study found that unburned fuels contained or produced polycyclic aromatic hydrocarbons (PAH) plus the toxic residues of various fuel additives. Studies by the Swiss government and Michigan State University show that PAH concentrations as low as two parts per billion can kill microscopic aquatic organisms at the bottom of the food chain (Giesy 1997). Wetlands associated with these lakes could also be adversely affected. Personal watercraft cause turbidity because they are

often operated in relatively shallow water. They could cause contamination through release of unburned fuels. There would be no adverse impacts on floodplains.

Winter Use — There would be negligible adverse impacts on water quality or on floodplains and wetlands as a result of the no-action alternative for winter use because the ground would be frozen and most use would occur on roads and trails.

Divide Creek Flood Hazard — The water quality of Divide Creek would continue to be threatened and could be adversely impacted during a flood by hazardous material spills from the maintenance facility. It would continue to be threatened and could be significantly impacted by hazardous materials kept in employees' homes or in the administrative facility. Emergency actions such as breaching the Going-to-the-Sun Road during high risk flood periods and any clearing of the channel would adversely affect water quality by increasing sediment loads in the water.

There could continue to be adverse impacts on the floodplain and riverine wetland associated with Divide Creek. Increased sediment and vegetation disturbance would continue to be caused by activity to protect property and employees.

West Side Discovery Center and Museum — There would be no adverse impacts on water quality or on floodplains and wetlands as a result of the no-action alternative for continued use of the Apgar visitor contact station because it is in a paved area (already disturbed) and no additional disturbance would take place.

Conclusion. There could be adverse impacts on water quality from increasing use of the Going-to-the-Sun Road. Visitors parking in undesignated areas, denuding vegetation and exposing soils, would result in increasing sediment in the rivers and streams. There could be significant adverse impacts on water quality from personal watercraft in Lake McDonald and St. Mary Lake and from flood abatement activities adjacent to Divide Creek.

There could be adverse impacts on wetlands from the use of personal watercraft.

Cumulative Impacts. Contamination of wetlands and waters inside the park from personal watercraft combined with that from outside the park would have a cumulative impact on water resources. Landowners adjacent to the park have built berms that have disturbed the channel of Divide Creek. A cumulative impact on water quality could result from flood abatement measures in the park being added to that disturbance.

Impacts on Aquatic Resources

Methods for Analyzing Impacts. Current studies (see bibliography) and staff biologists were consulted.

Existing Management Zoning. Aquatic resources would not be adversely affected by the continued use of the management zones as described in the 1977 *Master Plan*. Wilderness values would not be affected.

Visitor Use on the Going-to-the-Sun Road — Aquatic resources could be adversely affected by increased visitor use on the Going-to-the-Sun Road and increased off-road parking. Trampling of vegetation and exposure of the soil would lead to increased runoff into the rivers and streams adjacent to the road. Small soil particles that do not settle readily reduce light penetration and hinder the growth of aquatic plants and the activities of fish. High concentrations can clog the gills of aquatic animals and interfere with respiration. Larger soil particles settle, but in high concentrations they can smother bottom-dwelling organisms and fish eggs. Chronic low-level sedimentation can have significant adverse effects on aquatic resources by reducing the diversity and the amount of habitat available for aquatic insects and fish spawning.

Preservation of the Going-to-the-Sun Road — During the reconstruction of the Going-to-the-Sun Road aquatic resources would be affected by increased sediment and possibly by accidental spills of petroleum and other chemical products unless mitigating measures were used. With mitigation, impacts would be reduced. The impacts of sedimentation and increased turbidity on rivers and streams would be minimized during reconstruction by effective erosion control. Proper construction procedures would be used to prevent the contamination of adjacent rivers and streams caused by accidental petroleum spills.

Preservation of Historic Hotels and Visitor Services — Aquatic resources would not be affected by continued maintenance of the Many Glacier Hotel, Lake McDonald Lodge, and other historic structures in the park or by the eventual closure because ground disturbance would be negligible and standard water quality protection measures would be taken when there was ground disturbance.

Scenic Air Tours — Aquatic resources would not be affected by increases in scenic air tours because aircraft do not land in the park or cause ground disturbance.

Personal Watercraft — Personal watercraft on St. Mary Lake and Lake McDonald would adversely affect aquatic resources by increasing the risk of spills of petroleum products. Aquatic vegetation would also be adversely affected from increased sedimentation and turbidity caused by the operation of personal watercraft in the shallower areas of these lakes.

Winter Use — Winter use activities would not adversely affect aquatic resources because use occurs on roads and trails.

Divide Creek Flood Hazard — Aquatic resources would continue to be adversely affected by development on the Divide Creek floodplain and activity in the creek to control flooding. Continued activity in that area would result in increased sediment in Divide Creek. Small soil particles that do not settle quickly reduce light penetration and hinder the growth of aquatic plants and the activities of feeding fish. High concentrations can clog the gills of aquatic animals and interfere with respiration. Larger soil particles in high concentrations can smother bottom-dwelling organisms and fish eggs. Chronic low level sedimentation can have significant adverse effects on aquatic resources by reducing the diversity and the amount of habitat available for aquatic insects and fish spawning.

West Side Discovery Center and Museum — Continued use of the visitor contact station in Apgar would not adversely affect aquatic resources because it is in a previously disturbed area.

Conclusion. Aquatic resources could be adversely affected by the continued activity to control the flooding of Divide Creek. Aquatic resources could also be adversely affected by increased visitor use along the Going-to-the-Sun Road, the use of personal watercraft on St. Mary and Sherburne Lakes and Lake McDonald, and the reconstruction of the Going-to-the-Sun Road. Mitigation measures would be used to control adverse effects on aquatic resources during reconstruction of the Going-to-the-Sun Road.

Cumulative Impacts. The impacts on aquatic resources in Divide Creek from flood control measures combined with actions taken by private landowners and the Blackfeet Tribe could result in adverse effects. Aquatic resources inside and outside the park could also be adversely impacted by the use of personal watercraft inside and outside the park.

Impacts on Scenic Resources

Methods for Analyzing Impacts. A viewshed analysis was conducted using the park's geographic information system for all park roads, including the Going-to-the-Sun Road and developed areas along the road (see Viewshed map).

Existing Management Zoning. There would be no adverse effects on scenic views as a result of continuing the management zoning strategy described in the 1977 Master Plan because the zoning scheme would not affect views. Design standards would continue to be followed for any new developments. Wilderness values would not be affected.

Visitor Use on the Going-to-the-Sun Road — There would be no effect on the broad panoramic scenic views from the Going-to-the-Sun Road because there are no developments proposed that would affect the views. The view immediately adjacent could be adversely affected by off-road parking and the creation of denuded areas by illegal parking.

Preservation of the Going-to-the-Sun Road — Scenic resources would be temporarily adversely affected during the road reconstruction due to increased dust and construction activity.

Preservation of Historic Hotels and Visitor Services — There would be no effects on scenic views from continued operation and maintenance of the visitor overnight facilities and other visitor services because they are part of the historic landscape. However, when concession facilities deteriorated to the point that they were no longer open to the public, scenic integrity would be adversely affected.

Scenic Air Tours — Current and increasing numbers of unregulated scenic air tours would have significant adverse effects on scenic views from the Going-to-the-Sun Road and from other locations in Glacier National Park because the park's proposed wilderness would be adversely affected by the intrusion of mechanical objects.

Personal Watercraft — There would be a temporary adverse effect on the scenic views on Lake McDonald and St. Mary Lake from personal watercraft because the craft would disrupt the natural views across the lakes.

Winter Use - There would be no adverse impacts on scenic views from winter use because of the nature of the use and the small number of users.

Divide Creek Flood Hazard — There would be an adverse effect on the scenic views in the Divide Creek area from continued flood abatement activities.

West Side Discovery Center and Museum — Continued use of the Apgar visitor contact station would have little adverse effect on the scenic quality of the area because the area is already developed and has many other uses.

Conclusion. There would be adverse impacts on scenic resources from off-road parking along the Going-to-the-Sun Road, which would continue to denude adjacent vegetation. This could become a significant adverse impact as use increased. There would be adverse impacts on the scenic views on Lake McDonald and St. Mary Lake from PWC use. Adverse impacts could become significant as scenic air tour use increased.

Cumulative Impacts. There would be cumulative adverse effects on scenic views of Divide Creek due to combined flood abatement efforts by the park and adjacent landowners.

Impacts on Air Quality

Methods for Analyzing Impacts. A 1990 amendment to the Clean Air Act (section 176c) requires that the National Park Service analyze the impacts of the alternatives, including visitor traffic and staff commutes, on the ability to conform with air quality standards. Flathead County is currently not in attainment for particulate matter (PM-10). The NPS Air Quality Division was contacted to conduct the analysis of the alternatives on air quality. Wilderness values would not be affected.

Existing Management Zoning. There would be no adverse impacts on air quality as a result of continuing the management zoning strategy described in the 1977 Master Plan for Glacier National Park because the zoning scheme does not call for any action that would affect air quality.

Visitor Use on the Going-to-the-Sun Road — Visitors traveling through the park and park staff commutes would have negligible adverse effects on air quality from carbon monoxide emissions. Carbon monoxide emissions would continue to increase as visitation increased. It is not expected that this increase would affect the state's ability to maintain conformity with the required air quality standards. However, automobile emissions are not good for the park's air quality. Over the past 20 years, vehicle emissions have improved in general, so if auto use in the park increased in general, the net result would be no net gain in auto pollutants to the environment. Present monitoring does not indicate an increase in nitrous oxide. Furthermore, according to the park's Transportation Plan (NPS 1990d, 26), average daily traffic is projected to reach 6,080 by 2007 from the west entrance to Camas Road. The peak day volume may be 7,200-7,800 vehicles per day. Visitor

use limits would decrease emissions and have a beneficial effect on air quality. Additional analysis would be completed as part of the comprehensive use plan for the Going-to-the-Sun Road.

Preservation of the Going-to-the-Sun Road — Road construction would continue in accordance with DEQ guidelines and regulations to ensure continued maintenance of national air quality standards for motor vehicle-related pollutants such as ozone and carbon monoxide, and adverse effects would be avoided.

Preservation of Historic Hotels and Visitor Services — Air quality would not be affected by continued operation of the concession facilities in the park because the operations generate negligible air pollutants.

Scenic Air Tours — Continued increases in scenic air tour operations would not adversely affect air quality.

Personal Watercraft — Air quality could be adversely affected by PWC emissions. The effect would probably be negligible but would depend on the amount of activity.

Winter Use — Continued patterns of winter use, including motor vehicle emissions, might adversely impact air quality during atmospheric inversions.

Divide Creek Flood Hazard — Air quality would not be affected by the development adjacent to Divide Creek.

West Side Discovery Center and Museum — Air quality would not be adversely affected by continued use of the visitor contact station in Apgar because the facility does not pollute the air and the number of people using the area is small.

Conclusion. Overall, the effects on air quality would be minor. No state air quality standards would be knowingly exceeded at this time. Temporary adverse impacts might occur during construction from dust and potential operation of an asphalt batch plant, but they would not be significant. As scenic air tours, levels of winter use, and use of personal watercraft increased, air quality could be significantly affected during some periods of the year and during certain weather conditions.

Cumulative Impacts. The increase in carbon monoxide emissions caused by increased visitation, increased scenic air tours, and use of personal watercraft, combined with the increase in emissions from increasing traffic around the area, would cumulatively affect air quality.

Impacts on Threatened and Endangered and State-Rare Wildlife Species

Methods for Analyzing Impacts. Informal consultation was conducted with the U.S. Fish and Wildlife Service. A number of wildlife biologists from outside the National Park Service were consulted, as were Glacier National Park wildlife biologists, regarding all threatened, endangered, and state-rare species and wildlife species in general. Information was based on research and operational knowledge of wildlife activity in the park. The National Park Service recognizes that any development in wildlife habitat could displace wildlife or result in habituation of wildlife to humans. Because NPS policy calls for management of naturally functioning wildlife populations, displacement and habituation of wildlife to

human development and use are considered adverse effects. Wildlife habitat and use in developed areas in the park have already been affected, and impacts are described for changes in the existing conditions.

Existing Management Zoning. Impact Analysis. Continuing to follow the management zoning as outlined in the 1977 *Master Plan* for Glacier National Park would have no additional adverse impacts on threatened and endangered and state-listed rare species. Wilderness values would not be affected.

Further environmental analysis, NEPA documentation, and compliance with the Endangered Species Act, including consultation with the U.S. Fish and Wildlife Service, would be completed during the site analysis and design stage for all proposed developments.

Federally Listed Threatened and Endangered Species

Bald Eagles.

Visitor Use on the Going-to-the-Sun Road — The Going-to-the-Sun Road would continue to be managed as the principal visitor use corridor in the park. No new development would occur under this alternative. Consequently, direct loss of eagle habitat or removal of important habitat components such as foraging perches or screening vegetation would not occur due to management actions. However, eagles are susceptible to disturbance and displacement by human activities. Concentrated visitor use would continue in and near developed areas, roads, and trails in the corridor. The Going-to-the-Sun Road corridor includes two known nesting sites and is also part of a major bald eagle migration route. Available habitat and opportunities for nesting, perching, foraging, and roosting would continue to be limited by development and associated use. If visitor use increased and more visitors use occurred in eagle habitat, such as along lakeshores, disturbance of bald eagles could increase. Increased use of informal pullouts along the lakes would be likely to occur with increasing traffic volume. This indiscriminate use of the shorelines, if it occurred near foraging or resting perches, could also disturb eagles. There is one nest site near to the road that would be disturbed.

Human activity near bald eagle nests can disturb the birds, especially during nest building and incubation stages. Disturbance of nest sites and important foraging areas could reduce the reproductive success of the birds. Site-specific nest plans would be developed to minimize human activity near nest sites and foraging areas during sensitive periods of the breeding cycle to avoid disruption of normal behavior, loss of productivity, or abandonment of the breeding area. Visitor use restrictions, including site-specific and/or specific time closures, would continue to be placed on boating and hiking activity during sensitive nesting periods and spring migration in some nesting territories. These restrictions would vary depending on conditions at each of the nesting territories; some remote nests would have no restrictions. Education efforts would be directed toward informing visitors about habitat needs of and visitor impacts on bald eagles.

Preservation of the Going-to-the-Sun Road — Reconstruction of the Going-to-the-Sun Road would primarily occur along the higher road elevations outside of eagle habitat.

Preservation of Historic Hotels and Visitor Services — Ongoing maintenance of historic visitor service facilities has the potential of disturbing eagles that nest and feed in the Lake McDonald area. Mitigation would continue to be used to reduce those impacts. Ongoing maintenance of Many Glacier and other areas would not disturb any known eagles.

Scenic Air Tours — The continuation of unrestricted scenic air tours and anticipated increases in scenic air tours would continue to have a wide range of impacts on wildlife. Impacts caused by aircraft overflights have been reported in the scientific literature. In general, wildlife respond to low-altitude aircraft overflights. The closer the aircraft come to the animals, the more probable is a response. Stronger responses were noted as aircraft came closer to the animals. The manner in which wildlife react depends on the life history characteristics of the species, characteristics of the aircraft and flight activities, and a variety of other factors such as habitat type and previous exposure to aircraft. Some habituation to overflights has been observed when flights are frequent or regular but not among all species. Studies and incidental observations have documented various effects of overflights on wildlife, including physiological and behavioral responses (indicators of stress), accidental injury, reproductive losses, energy losses, and habitat avoidance and abandonment (NPS 1995, Knight and Gutzwiller 1994, NPCA 1990). Whether effects such as increased heart rates cause harm is unknown, as are long-term impacts such as population effects due to decreased reproductive success.

Breeding bald eagles showed the greatest alert and flight response to helicopters, compared to jets and light planes, in a study in Arizona and Michigan (Grubb and Bowerman 1997). One pair of bald eagles at Cross Creek National Wildlife Refuge reportedly abandoned nesting activities altogether and left the area after repeated overflights by a military helicopter (Gladdys 1983, as reported in NPS 1995). Low level overflights have caused eagles to attack, avoid, or leave an area entirely (Fyfe and Olendorf 1976; Fraser et al. 1985; Grubb and King 1991 in Grubb and Bowerman 1997). Helicopter overflights in Glacier are suspected of disrupting nesting and foraging activities of bald eagles based on evidence from the literature and known helicopter flight paths in the park (memorandum dated March 7, 1994, from the superintendent of Glacier National Park to the NPS acting associate director for operations as reported in NPS 1995). Scenic air tours through raptor migration corridors, where migrating raptors sometimes fly through in numbers that exceed 50-100 birds per hour, have the potential for collisions and disruption of bird flight paths. Consequently, there could be adverse impacts on bald eagles from continued and increasing scenic air tour activity, especially helicopter tours, throughout the park.

Personal Watercraft — Bald eagles are known to be disturbed by boat use (Skagen 1980; Knight and Knight 1984; Buehler et al. 1991; McGarigal et al. 1991; Stalmaster and Kaiser 1998). The National Park Service requires the Lake McDonald tour boat concessioner to travel at low speeds on the lake. Personal

watercraft are high performance vessels designed for speed and maneuverability. The combination of speed, ability to maneuver into shallows, and noise (accentuated by repeated accelerations and decelerations) of personal watercraft, particularly when used in groups, would cause various impacts on eagles that use the lakes, depending on time, frequency, duration, and location of use. Such impacts would include disturbance, avoidance, or displacement from areas along the lakes and could eventually result in permanent loss of habitat. Continued disturbance could result in decreased reproductive success or nest abandonment. Restrictions on the time and location of use could be imposed to reduce some impacts.

Winter Use — Bald eagles use the Lake McDonald and St. Mary Lake areas during the late fall, winter, and early spring when increased winter use by visitors may occur, primarily on the Going-to-the-Sun Road. Visitors can disturb and even displace eagles during critical winter migration periods. Visitors can also disrupt early nesting activity and incubation, thus increasing the chances of nest abandonment or failure. The park has imposed temporary limited area closures along Lake McDonald in the past to protect nesting eagles.

Divide Creek Flood Hazard — There would be no effect on bald eagles with continued flood abatement and development in Divide Creek because there are no known nests or foraging areas near the area.

West Side Discovery Center and Museum — The Apgar visitor contact station is part of the larger development in bald eagle foraging habitat associated with the lower lakeshore and outlet. No new development would occur in this area, and retaining the contact station would not cause more impacts. However, the developed area and associated use along the lakeshore and outlet would continue to affect eagle habitat and displace birds. If visitor use increased and there was more visitor use near the outlet and lakeshore, disturbance of bald eagles would probably increase. Restrictions on human activity in these areas could be imposed during critical eagle use times.

Gray Wolves.

Visitor Use on the Going-to-the-Sun Road — Wolves could be indirectly affected by increasing use along the Going-to-the-Sun Road in St. Mary Valley, where there is evidence that wolves are recolonizing. Increasing use on the Going-to-the-Sun Road could displace elk that feed in the meadows. This could reduce prey availability if prey numbers declined as a result of lost foraging opportunities in meadows or if animals were displaced to areas outside the park where they could be hunted. Displacement effects would probably be minor because elk are expected to habituate to increased use. Elk have evidently adapted to present levels and types of human disturbance along this often heavily used road. Where elk are habituated to human presence along roads, disturbance from vehicles and people who stop to view them appear to be minor (Schultz and Bailey 1978; Cole 1983). Gradual increases in this same type and pattern of human activity in a road corridor would probably continue to displace elk adjacent to the road but would probably not affect their distribution or displace them from the area. An exception to

this would be if people left the regularly traveled road or trail areas, especially if they were to approach wildlife. In that case, animals would probably be displaced from feeding areas.

Preservation of the Going-to-the-Sun Road — Reconstruction of the Going-to-the-Sun Road could temporarily displace wolves and prey species in the vicinity of construction, although most of the reconstruction would occur outside of known wolf habitat.

Preservation of Historic Hotels and Visitor Service — Continuation of early season maintenance activity at the Many Glacier Hotel and other lodges and visitor facilities throughout the park would not result in any additional impacts on wolves. Temporary avoidance of the building areas during maintenance activities would continue. Eventual closure of facilities would result in a positive impact by decreasing human disturbance.

Scenic Air Tours — Gray wolves could be disturbed by low flying scenic air tours, especially helicopters, over the park. Documented responses of wolves to aircraft have varied (Chapman 1977; NPS 1995). Some wolves ignored aircraft; others ran and jumped toward aircraft; and others fled. Several studies indicated that wolves habituated to aircraft if they were repeatedly flown over at altitudes of 100 meters or more. Flights lower than 100 meters seemed to frighten wolves that were accustomed to aircraft (Chapman 1977). Helicopters would probably have greater effects on wolves than fixed-wing aircraft because helicopters are able to fly at lower elevations.

Personal Watercraft — Noise and rapid movement of personal watercraft, particularly along the shorelines of Lake McDonald and St. Mary Lake, could disturb wolves or prey species in areas surrounding the lake and result in avoidance of those areas.

Winter Use — There would be no actions taken to enhance public access. Wolves tend to avoid humans and areas near high use roads and would probably avoid the areas near the access road and ski trails, at least when people were present. There is ungulate wintering habitat throughout the park, including the Many Glacier, St. Mary, McDonald, and North Fork Valleys, among other areas inside and outside of the park. Increased human presence could affect wolf prey species' habitat use and distribution. Prey species would also be likely to avoid human activity near access roads and trails. This disturbance would probably have a negligible influence on their distribution and movements. Use levels would be relatively low and primarily limited to the road and trails. Animals often habituate to human activity in protected areas such as parks, and where adjacent cover for screening and refuge exists. However, if prey species were displaced to less productive areas or to portions of their winter range outside the park, where they could be hunted, this would reduce prey availability for wolves. The severity of this reduction would depend on habitat conditions and prey population status and trends as they affected adequate prey numbers.

Divide Creek Flood Hazard and West Side Discovery Center and Museum — Continued use of the Divide Creek facilities and Apgar visitor contact station

would not adversely affect wolves because these facilities are year-round centers of human activity that wolves already avoid.

Grizzly Bears.

Visitor Use on the Going-to-the Sun Road — Increasing visitor use resulting in more informal parking and use along the Going-to-the-Sun Road could eventually adversely affect grizzly bears. Bears display varying responses to roads and road activity, including increased habituation through human contact and food attractants, or avoidance resulting in a decrease of usable habitat (see conclusion for more detailed discussion on habituation). Increased habituation can lead to increased incidences of human/bear contacts and conflicts that can ultimately result in the removal or death of bears. Additionally, the disturbance generated by heavy traffic in grizzly habitat may create barriers to grizzly movement. Bears may alter their use of areas near roads from daylight to night, allowing continued use of habitat near roads and crossings.

Preservation of the Going-to-the-Sun Road — Reconstruction of the Going-to-the-Sun Road could temporarily displace bears from the area but also could create unnatural attractants such as food, petroleum products, and human waste. Measures to reduce impacts from construction, such as restrictions on yearly initiation of construction containment procedures for construction materials, times of day that construction would be allowed, or food storage and disposal requirements, would be developed.

Preservation of Historic Hotels and Visitor Services — Continued maintenance of historic structures would not affect bears because repair of the buildings would be confined to current developed areas where there is no habitat available.

Scenic Air Tours — Grizzly bears could be affected by continued and increasing scenic air tour overflights, especially by helicopters, throughout the park. It has been documented that grizzly bears run away from aircraft flying at altitudes as high as 3,000 feet. Harding and Nagy (1976) noted that grizzly bears never became habituated to aircraft, despite frequent exposure. Grizzly bears have also been noted to abandon areas in response to small craft overflights, even when overflights were infrequent (McCourt et al. 1974). In Glacier, bear research studies that used helicopters in the park from 1982 to 1986 found that 80 percent of grizzly bears observed in a remote section of the park reacted strongly to helicopters (Kendall, Waits, and Schirokauer 1996). Bears feeding on cutworm moths on high peaks and other exposed feeding sites would also be susceptible. Limited habitat availability in spring and fall (when bears are emerging from or preparing for hibernation) would also result in increased susceptibility to potential impacts.

Personal Watercraft — Personal watercraft on Lake McDonald, Lake Sherburne and St. Mary Lake could disturb bears in areas surrounding the lakes and result in displacement or avoidance of those areas and possibly permanent loss of habitat.

Winter Use — Continuing winter use patterns would not have adverse effects on grizzly bears in the Lake McDonald Valley. The large valleys throughout the park

such as Many Glacier and Two Medicine provide quality habitat in spring and before fall hibernation because they are the last areas to be covered with snow in winter and the first areas to melt out in spring. If visitor use increased during spring and fall in the valleys, increased encounters between bears and visitors would probably result. This could adversely affect bears and could result in removal, displacement, or death.

Divide Creek Flood Hazard and West Side Discovery Center and Museum — Continued use of the Divide Creek facilities and Apgar visitor contact station would not result in any additional impacts on bears because these facilities are already year-round centers of human activity.

Peregrine Falcons.

Although suitable habitat exists in many locations throughout Glacier, this species is rarely recorded in the park, and there are no known park nest sites. No effect on this species would be expected.

Federally Proposed Species

Lynx.

Winter Use — There is very little information available on lynx use in the park, but they could be adversely affected if winter use increased appreciably in areas like the Lake McDonald Valley, the east side of the park, or other suitable coniferous forest habitats. Lynx could also be affected by the use of personal watercraft on Lake McDonald and St. Mary Lake, although the high degree of human use and development along the Going-to-the-Sun Road corridor has probably already negatively affected lynx use of this habitat during the visitor use season.

There could be adverse impacts on lynx from increased scenic air tour activity, especially helicopter tours, throughout the park. In general, wildlife respond to low-altitude aircraft overflights, and the closer the aircraft, the greater the probability of response and the stronger the response. The type of response depends on the life history characteristics of the species, characteristics of the aircraft and flight activities, and a variety of other factors, such as habitat type and previous exposure to aircraft. Some tolerance for overflights has been observed when flights were frequent or regular but not among all species. Studies and incidental observations have documented various effects of overflights on wildlife, including physiological and behavioral responses (indicators of stress), accidental injury, reproductive losses, energy losses, and habitat avoidance and abandonment (NPS 1995; Knight and Gutzwiller 1994; NPCA 1990). Whether effects such as increased heart rates cause harm is unknown, as are long-term impacts like population effects due to decreased reproductive success. Lynx would probably be most susceptible to impacts during vulnerable life stages such as denning or when prey populations were low.

Other no-action alternatives would have no effects on lynx.

State-Listed Rare Species

There is very little information available about the use of the park by many of the state-listed rare species, so further analysis would be needed during the environmental assessments of individual actions. The information available is discussed below.

Common Loon.

Scenic air tours would have an unknown effect on the common loon, although studies have shown various responses of waterbirds to aircraft overflights. The combination of rapid movement, ability to maneuver into shallows, and noise of personal watercraft, particularly when used in groups, would impact loons on Lake McDonald and St. Mary Lake. Impacts would vary depending on time, frequency, duration, and location of use and would probably include disturbance, avoidance, or displacement along the lakes and could eventually result in the permanent loss of habitat. Continued disturbance could result in decreased reproductive success and nest abandonment. Because loon nests float, they would be more prone to PWC disturbance, including wakes. Other no-action alternatives would have no effect on loons.

Harlequin Duck.

Harlequin ducks could be adversely affected by the use of informal pullouts along McDonald Creek that provide easy human access to stretches of creek habitat. Harlequins are very sensitive to human disturbance and will not attempt to nest again if disturbed. Scenic air tours would have an unknown effect on this species, although studies have shown various responses of waterbirds to aircraft overflights. Other no-action alternatives would have no effect on harlequin ducks.

Osprey.

Osprey would not be adversely affected by any of the actions except possibly by increased air tours and lifting the temporary ban on personal watercraft. The effects would be similar to those on loons.

Northern Goshawk, Cooper's Hawk, Golden Eagle, Merlin, and Prairie Falcon.

These birds would not be adversely affected by any of the actions except possibly by increasing scenic air tours. The degree of effect is not known. Scenic air tours through raptor migration corridors could adversely affect the raptors. The effects would include the potential for collision between raptors and helicopters and the disruption of flight paths. Golden eagles would be the most likely to be affected because they are the most abundant during migrations.

Trumpeter Swan, Northern Pygmy Owl, Barred Owl, Great Gray Owl, Long-eared Owl, Boreal Owl, Northern Saw-whet Owl, Northern Hawk-Owl, Pileated Woodpecker, Olive-sided Flycatcher, Western Bluebird, LeConte's Sparrow, Clay-colored Sparrow, Brewer's Sparrow, and Gyrfalcon.

There is not a great deal of information available about these species, so it is not possible to predict the full effects of the actions. Scenic air tours would have unknown effects. All of the species could be affected to a limited degree by loss of habitat caused by informal pullouts and disturbance from increased visitor use.

Northern Bog Lemming.

The northern bog lemming would probably not be adversely affected by any of the alternatives. Impacts are not expected to occur in lemming habitat.

Marten, Fisher, and Wolverine.

Development and visitor use in the lower elevations of the park would continue to reduce the habitat suitability and use of these areas. Increasing winter use by visitors in these areas could further disturb these species, although even the current, generally low levels of visitor use may have already resulted in avoidance of these areas. Wolverines are the most sensitive to human presence. If increasing winter use extended into higher elevations, the wolverine could be affected by disturbance at late winter den sites; animals could abandon dens when disturbed during this sensitive period.

Conclusion. Most of the above species would be affected to some degree by increasing visitor use in the Going-to-the-Sun Road corridor and by increased winter use. The extent of impacts from scenic air tours is unknown, although behavioral responses for some of these species and the effects of low elevation flights have been documented.

Grizzly bears have the greatest probability of being significantly affected. Adult females and subadult males often feed near humans, so they more often become habituated than other bears (Mattson et al. 1987; Olsen et al. 1987; Warner 1987). Adult males are also known to habituate to humans (Herrero 1985). Habituated females may teach this behavior to their offspring. Adult females and subadult males more often come into conflict with humans than adult males because of habituation. Consequently subadult males and adult females are more often killed by humans, especially in areas where the bear population is protected from hunting (Craighead et al. 1988). Any loss of female bears from the population is significant, given that recovery of bears in the ecosystem is dependent on the survival and reproduction of females.

Wolves could be adversely impacted by increased winter use, particularly if the same irregular plowing pattern continued on the east side of the park, which allows more people into ungulate wintering areas. This might disperse other wildlife such as elk or deer and disrupt the feeding behavior of wolves, because

they abandon kills when disturbed. Increasing use along the Going-to-the-Sun Road could displace wildlife or cause habituation, which could decrease their availability as prey.

Cumulative Impacts. The *Grizzly Bear Recovery Plan for the Northern Continental Divide Ecosystem*, as developed by the U.S. Fish and Wildlife Service and the Interagency Grizzly Bear Committee (in which the park staff participates), outlines the park's responsibility for actions necessary for the conservation and recovery of the grizzly bear. Implementation of this plan will result in positive cumulative benefits for the recovery of the grizzly bear.

The actions called for in the *Montana Bald Eagle Management Plan*, completed by state and federal agencies with private landowners, would result in positive cumulative impacts on bald eagle recovery in the ecosystem. The management goal for Montana is to provide secure habitat for bald eagles and to maintain a viable, healthy, and self-sustaining population as close to peak level as possible. However, productivity (the number of young produced and fledged) of eagle nests in the park is poor and is below the level established for recovery of the species. The low productivity is attributed to a relatively short nesting season, decline in native fish populations, and recreational facility development and associated use in the nesting territories.

The implementation of actions called for in the *Northern Rocky Mountain Wolf Recovery Plan* would result in positive cumulative impacts for the recovery of the gray wolf. A viable prey base and secure denning areas are particularly important. Disruption of prey, particularly on winter range, coupled with continued development outside the park and problems with landowners, could have adverse cumulative effects.

Cumulative effects could result from continued management as proposed in the no-action alternative and actions outside the boundary, such as coal mining and logging in British Columbia, increasing private development in the North and Middle Fork Valleys and the corridor between West Glacier and Columbia Falls, increased freight train traffic carrying hazardous materials, and gas and oil leases and private development on the Blackfeet Indian Reservation. Because the park is not large enough to support sustainable populations of all the species, the impacts could be cumulative and adverse. Winter use has the greatest potential for impacts.

Impacts on Wildlife Other than Listed Species

Impact Analysis.

Visitor Use on the Going-to-the-Sun Road — Increased use of the Going-to-the-Sun Road and informal pullouts along the road could result in further loss of habitat and disturbance of various wildlife species that live or travel close to the road.

Preservation of the Going-to-the-Sun Road — Reconstruction of the Going-to-the-Sun Road would temporarily adversely affect wildlife species that live or

travel adjacent to the road. Wildlife would be temporarily displaced during construction. No long-term effects would be expected.

Preservation of Historic Hotels and Visitor Services — Continuation of early season maintenance activity at the Many Glacier Hotel and other lodges and visitor facilities throughout the park would not result in any additional impacts on wildlife. Eventual closure of facilities, and therefore decreasing visitor activity in the area, would result in a positive impact on wildlife species that have been displaced.

Scenic Air Tours — Unrestricted scenic air tours and anticipated increases could adversely affect wildlife species over time, disrupting behavior and possibly reproduction. Scientific evidence from Glacier and other areas suggests that low flying aircraft (especially helicopters) alter the behavior of wildlife in the natural environment and subject them to stress. Stress probably affects some wildlife species more than others during particularly vulnerable times such as winter or migration. Studies of mountain goats during the summer in the Canadian Rockies just north of Glacier found that helicopter flights disturbed mountain goats, caused the disintegration of social groups, and resulted in severe injury (Cote 1996). A similar study on Dall sheep in the Yukon showed that sheep ran from helicopters, even at distances of 3 km (Frid 1998). The studies recommended restricting helicopter flights within 2-3.5 km of alpine areas and cliffs known to support mountain goat populations and Dall sheep. A number of other studies on a variety of wildlife species indicate behavioral responses to overflights (NPS 1995).

Personal Watercraft — Wildlife would be adversely affected by use of personal watercraft on Lake McDonald, Lake Sherburne, and St. Mary Lake. PWC noise, rapid movement, and access to shallow areas would cause various impacts on wildlife that use the lake and adjacent shoreline, depending on time, frequency, duration, and location of use. Such impacts would include disturbance, avoidance, or displacement from areas along the lakes and could eventually result in permanent loss of habitat. Waterfowl in general are wary and seek refuge from many forms of disturbance, particularly if the activities are associated with loud noise and rapid movement (Knight and Gutzwiller 1995). Continued disturbance could result in decreased reproductive success or even mortality from direct or indirect effects. Lake McDonald is an important staging area for migrating and post-breeding Canada geese and migrating ducks and swans. Displacement of these birds to less secure areas at a vulnerable period could affect their survival.

Winter Use — Increased winter use in the lower elevations of the park would adversely affect wildlife that are active in the winter, displacing them from areas near roads, ski trails, and developed areas. It could also result in habituation and could lead to more conflicts with wildlife such as white-tailed deer, bighorn sheep, or mountain lions.

Divide Creek Flood Hazard and West Side Discovery Center and Museum — The development adjacent to Divide Creek and the Apgar visitor contact station would not have any additional effects on wildlife. Animals would continue to be displaced from these areas of concentrated human activity.

Conclusion. Wildlife could be adversely affected by increased traffic, informal pullouts, and increased use of facilities along the Going-to-the-Sun Road, increased unrestricted scenic air tour activity, increased winter use, and the use of personal watercraft.

Cumulative Impacts. Continued management as proposed in the no-action alternative and actions outside the boundary, such as timber harvest activities on Forest Service roads, private development in the North and Middle Fork Valleys and in the corridor between West Glacier and Columbia Falls, increased train traffic carrying hazardous materials, coal development in British Columbia, and gas and oil and private development on the Blackfeet Indian Reservation, could cumulatively affect wildlife populations and habitat. Because the park is not large enough to support sustainable populations of all these species, the impacts could be cumulative and adverse.

Impacts on Vegetation, Including Species at Risk and State-Rare Plant Species

Methods for Analyzing Impacts. There are no known federally listed threatened or endangered plant species in Glacier National Park. There are federally listed species at risk and state-listed rare plant species. Databases kept by Glacier National Park and the Montana Natural Heritage Program were consulted for known rare plant locations. Surveys were not conducted of each of the areas proposed for development, and site-specific surveys would have to be done during the design phase of the projects to determine if any rare plants or species at risk were present. If they are found in the areas to be developed, development could be designed to avoid adverse impacts, another site could be selected for development, or, as a last resort, the plants could be moved to suitable habitat.

Existing Management Zoning. There would be no additional adverse impacts on federally listed species at risk and state-rare plant species as a result of continuation of the management zoning strategy as described in the 1977 *Master Plan* for Glacier National Park because the zoning scheme does not call for any actions that would disturb vegetation or rare species. Wilderness values would not be affected.

Visitor Use on the Going-to-the-Sun Road — Continuing the current visitor use at Lunch Creek and Logan Pass would result in adverse impacts on vegetation from continued trampling of plants. There is also a risk of destroying rare plant species. Trampling results in plant destruction and slight shifts in species composition. Vegetation disturbance also can lead to increases in exotic plant populations.

Preservation of the Going-to-the-Sun Road — There would be no adverse impacts on federally listed species at risk and state-rare plant species from reconstruction of the Going-to-the-Sun Road. These plants would be avoided or moved when there were no other options.

Preservation of Historic Hotels and Visitor Services — Cultural heritage and visitor services would not affect rare plants.

Scenic Air Tours — Scenic air tours would not affect rare plants because they are not allowed to land in the park.

Personal Watercraft — The use of personal watercraft could result in significant adverse impacts on known rare plants such as the water bulrush in St. Mary Lake and Lake McDonald. Personal watercraft have a shallow draft with the ability to penetrate areas not formerly available to conventional watercraft. This access can adversely impact aquatic vegetation. Other adverse impacts would be caused by the release of petroleum products into the water, increased turbidity, and soil disruption from operation in shallower waters.

Personal watercraft are highly maneuverable and can operate well in very shallow water (less than 12 inches deep) and are able to operate in sensitive aquatic habitats. Potential impacts include the loss of emergent aquatic vegetation, shoreline erosion, and increased water turbidity. These impacts are amplified because PWC users frequently run multiple circuits in the same area.

Winter Use — Plants are dormant during the winter and covered with snow, so no effect would be expected.

Divide Creek Flood Hazard — Continuing the flood abatement activities on Divide Creek would not affect rare plants.

West Side Discovery Center and Museum — The continued use of the Apgar visitor contact station would not affect rare plants.

Conclusion. There might be adverse impacts on species at risk from off-road parking along the Going-to-the-Sun Road, the continued undirected and unmanaged use of the Lunch Creek area, and the operation of personal watercraft.

Cumulative Impacts. Several of the rare and sensitive species in the park are found in few other locations in the region. Therefore, seemingly minor impacts on a few individual plant species could have serious cumulative effects on some of these species.

Impacts on Vegetation (General)

Visitor Use on the Going-to-the-Sun Road — As visitation increased, more off-road parking along the Going-to-the-Sun Road would result in adverse impacts on vegetation from trampling and denuding of vegetation. Along road shoulders vegetation would be crushed, and soils would be compacted. Exotic vegetation can become more prevalent in areas where vegetation is disturbed.

Preservation of the Going-to-the-Sun Road — Vegetation would be adversely affected during road reconstruction because of disturbance and removal of vegetation during the course of the repairs. Mitigation would include revegetation.

Preservation of Historic Hotels and Visitor Services — There would be no adverse impacts on vegetation as a result of the no-action alternative in regard to cultural heritage and visitor services.

Scenic Air Tours — There would be no adverse impacts on vegetation as a result of continued scenic air tours because aircraft do not land in the park.

Personal Watercraft — The use of personal watercraft could result in significant adverse impacts on wetland vegetation in St. Mary and Sherburne Lakes and

Lake McDonald. Personal watercraft have a shallow draft with the ability to penetrate areas not available to conventional watercraft. This use adversely impacts aquatic vegetation. Other adverse impacts on vegetation result from the release of petroleum products into the water, increased turbidity, and soil disruption from operation in relatively shallow water.

Winter Use — No additional adverse impacts would be caused by winter use patterns. Some roadside vegetation is affected by graveling and plowing.

Divide Creek Flood Hazard — There would be no adverse impacts caused by leaving the development adjacent to Divide Creek. Continued flood abatement would disturb the floodplain, which would be vulnerable to exotic plant invasion.

West Side Discovery Center and Museum — There would be no adverse impacts caused by the continued use of the Apgar visitor contact station.

Conclusion. There would be adverse impacts on vegetation from off-road parking along the Going-to-the-Sun Road and activities associated with the manipulation of Divide Creek. Continued flood abatement activities at Divide Creek would result in the adverse impacts on vegetation because of the use of heavy equipment off-road. Wetland vegetation would be adversely impacted by the use of personal watercraft in the three lakes and indirectly from the release of petroleum products and increased turbidity.

Cumulative Impacts. Over time increased use of personal watercraft in sensitive areas combined with similar activities outside the park would decrease the diversity of vegetation throughout the region. Several of the rare and sensitive species in the park are found in few other locations in the region. Therefore, seemingly minor impacts on a few individual plants could have serious adverse effects on the survival of a viable population of these species.

Impacts on Soils

Methods for Analyzing Impacts. Soil surveys have been conducted for all areas of the park except the Middle Fork. The surveys identified and mapped the soils in the park and discussed their strengths and weaknesses in regard to development and ability to support vegetation. Impact information was derived from these reports based on the actions in each of the alternatives.

Existing Management Zoning. Soils would not be affected by continued management of the park using the management zones described in the 1977 Master Plan for Glacier National Park because the zoning scheme does not call for any actions that would disturb soils. Wilderness values would not be affected.

Visitor Use on the Going-to-the-Sun Road — Increased use along the Going-to-the-Sun Road and off-road parking would adversely affect soils. Exposed soils would become compacted, decreasing their ability to absorb water and support plant growth. In areas where the soil layer is shallow, the soils could be washed away after exposure, leaving only bedrock.

Preservation of the Going-to-the-Sun Road — Soils would be adversely affected during road reconstruction. Adverse effects would be temporary, and most would be mitigated to reduce the amount of sediment entering watercourses. All

soils from which the vegetation was removed would be revegetated to protect the soils from wind.

Preservation of Historic Hotels and Visitor Services — Continued maintenance of the cultural heritage and visitor services of Glacier would result in no adverse impacts on soils.

Scenic Air Tours — Continued scenic air tour activity and anticipated increases would have no adverse impacts on soils because there would be no ground disturbance.

Personal Watercraft — The soils found in the shallower sections of St. Mary Lake and Lake McDonald would be adversely affected by personal watercraft because of soil disturbance and turbidity in shallow water. There would be contamination from petroleum products released into the water that would eventually settle in the soil.

Winter Use — Continued winter use activities would have no adverse impacts on soils because there would be no ground disturbance.

Divide Creek Flood Hazard — There could be adverse impacts on soils from flood abatement activities and from the use of heavy equipment off-road.

West Side Discovery Center and Museum — Continued use of the visitor contact station in Apgar would have no adverse impacts on soils because there would be no ground disturbance.

Conclusion. There would be significant adverse impacts on soils from illegal parking as visitor use along the Going-to-the-Sun Road increased. Soils in the shallower sections of St. Mary Lake and Lake McDonald would also be significantly adversely affected by the use of personal watercraft in the park.

Cumulative Impacts. There would be no known cumulative impacts on soils.

Impacts on Natural Sounds

Methods for Analyzing Impacts. Glacier National Park has been identified by the National Park Service as one of nine parks where “maintaining or restoring natural quiet is an immediate priority” (NPS 1995). Glacier has been included in sound studies of seismic blasting associated with mineral exploration (EPA 1995) and aircraft overflights (NPS 1995). More recently, natural sound levels were measured at four locations in the park, and analyses were conducted regarding the frequency and amplitude of such human-caused intrusions as automobiles and aircraft. These studies were all limited in the extent of the park that was surveyed, so the impact analysis that follows is based on research at Glacier and at other NPS units.

Existing Management Zoning. Continuing use of the management zones system described in the 1977 *Master Plan* for Glacier National Park would not have an adverse effect on natural sounds because the zoning scheme does not contain actions that affect natural sound. Wilderness values would not be affected by management zoning.

Visitor Use on the Going-to-the-Sun Road — Increased visitor use of the Going-to-the-Sun Road could result in some increase in noise and masking of natural sounds, which could be an adverse effect.

Preservation of the Going-to-the-Sun Road — During reconstruction of the Going-to-the-Sun Road, there would be a temporary increase in noise in the road corridor caused by the use of heavy equipment, which would be a temporary adverse effect.

Preservation of Historic Hotels and Visitor Services — Continued maintenance and operation of the park's cultural heritage and visitor service facilities would not cause a significant increase in noise and would not be an adverse impact on natural sounds.

Scenic Air Tours — Continuing current scenic air tours and the expected increase in that activity over time would adversely impact natural sounds by increasing the frequency of aircraft noise (from rotors and engines). This could eventually result in a significant adverse impact as noise from scenic air tours began to permeate more regularly and for longer periods over extensive areas.

Personal Watercraft — Natural sounds would be significantly adversely impacted in the vicinity of Lake McDonald and St. Mary Lake by personal watercraft. Personal watercraft create an erratic sound because of their method of propulsion. The sound changes in response to load, cavitation (the formation of partial vacuums in the water), and throttle setting, all of which vary constantly. Personal watercraft are generally operated close to shorelines and developed areas, intruding on and masking natural sounds.

Current PWC brands produce noise in the range of 85-105 decibels per unit. The sound emitted is in the form of a high pitched whine. This sound, while not exceeding park decibel limits from the shoreline, can be annoying to other park visitors. (The park decibel limit is 82 decibels at 82 feet [36 CFR 3.7].) PWC noise is compounded when PWC users travel in groups, causing cumulative noise. Also, PWC operators frequently accelerate and decelerate their machines, which affects noise levels.

Winter Use — There would be no adverse impacts on natural sounds from the continued management of current levels and types of winter use experiences.

Divide Creek Flood Hazard — There would be negligible adverse impacts on natural sounds from the flood abatement activities. The effects would be temporary and would occur only during flood abatement activities.

West Side Discovery Center and Museum — There would be no adverse impacts on natural sounds from the continued use of the visitor contact station in Apgar.

Conclusion. Natural sounds would be significantly adversely impacted by unregulated increased scenic air tour activity and by the use of personal watercraft on selected lakes in the park. Natural sounds would be temporarily adversely impacted along the Going-to-the-Sun Road corridor from increased traffic and visitor use during reconstruction.

Cumulative Impacts. The combination of increased scenic air tours, personal watercraft, and increased traffic on the Going-to-the-Sun Road could have a

cumulative adverse effect in the park. This could be exacerbated by increases in development and community activities outside the park. Because air tour operators are based outside the park, there would be a cumulative effect on noise levels outside the park.

Impacts on Biological Diversity

Methods for Analyzing Impacts. Biological diversity means the full range of variety and variability that has evolved in and among living organisms and their ecological complexes, including ecosystem or community diversity, species diversity, genetic diversity, and the diversity of ecological processes (Kasten Senate Bill, 100th Congress).

Glacier National Park Global Climate Change Research Program Capabilities and Interest Statement (Key 1990) and World Heritage List Nomination, Waterton-Glacier International Peace Park (Canada and the United States of America 1994 as amended) described the status of biodiversity in the park, which was compared to the potential impacts on wildlife and vegetation as described in earlier sections of this Draft General Management Plan and Environmental Impact Statement.

Existing Management Zoning. Continuing use of the management zones described in the 1977 Master Plan would not adversely affect biodiversity because no actions called for in the plan would affect biodiversity. Wilderness values would not be affected.

Visitor Use of the Going-to-the-Sun Road — Impacts on biodiversity from visitor use of the Going-to-the-Sun Road would vary by road segment and time of year. Increasing use of the Going-to-the-Sun Road might cause additional displacement of some animal species that are less tolerant of people (such as wolverines and grizzly bears) from the road corridor, thus contributing to habitat fragmentation. Increasing use might also result in more road-killed wildlife. Increases in off-road parking along the road could lead to destruction of vegetation and proliferation of exotic species.

Preservation of the Going-to-the-Sun Road — Biodiversity could be adversely affected because of the length of the reconstruction process. It could result in more fragmentation of habitat and displacement of wildlife species because animals could be displaced by activity associated with construction. Only those species that are tolerant of road reconstruction activity would remain, decreasing the diversity of wildlife in the area.

Preservation of Historic Hotels and Visitor Services — Continued maintenance and operation of the visitor service facilities throughout the park should have little impact on park biological diversity overall. Depending on the timing and types of repairs, there would be some displacement of species around such areas as the Lake McDonald Lodge and the Village Motor Inn. Displacement would apply particularly to eagles that use large trees in these areas as perches when searching for food.

Scenic Air Tours — Scenic air tours operated over Glacier National Park would indirectly impact biological diversity as the result of the effects of aircraft noise on wildlife. Specific impacts would include: interruption of courtship behavior, disturbance during critical feeding periods (early spring and fall), and increased energy expenditure.

Personal Watercraft — Biological diversity could be adversely impacted by the use of personal watercraft on Lake McDonald and St. Mary Lake. Personal watercraft can access shallow shoreline areas where biological diversity tends to be higher than in other lake areas.

Evidence suggests that the noise associated with personal watercraft causes many wildlife species (including bald eagles and common loons) to leave their feeding, roosting, or cover areas. These impacts can be exacerbated by the ability of the craft to access shallow bays and inlets. This access can adversely impact the diversity of wildlife and aquatic vegetation.

Hydrocarbon emissions attributable to personal watercraft could be lethal to some aquatic organisms, which could impact aquatic ecosystems.

Winter Use — The continuation of winter use patterns could have additional impacts on park biological diversity. Impacts would be attributable to the avoidance response exhibited by some species when vehicles or skiers enter their winter range.

Divide Creek Flood Hazard — Impacts on Divide Creek and on associated wetland areas at St. Mary could impact the integrity and biodiversity of local aquatic ecosystems. The Divide Creek channel and associated wetlands are periodically damaged by sedimentation associated with road removal and by hazardous materials that are swept into the water during flooding. The disturbed channel would be subject to exotic plant invasion.

West Side Discovery Center and Museum — There would be few additional impacts on park biological diversity, particularly wildlife, from continued use of the visitor contact station in Apgar. Increased use could result in longer hours and more congestion in the Apgar area, which could adversely affect wildlife movements, thus potentially impacting biodiversity. Grizzly bears and bald eagles are known to use the Apgar area.

Conclusion. It is unlikely that any plant or animal species would be eliminated as a result of continuing the park management direction as represented in the no-action alternatives. There would, however, continue to be impacts on individual species and on biological communities in the park. Some of these impacts could weaken biological diversity by damaging community integrity or by preventing species numbers from naturally expanding.

Cumulative Impacts. The cumulative impacts of the no-action alternatives on wildlife would probably grow over time. The principal concern would be dispersal of certain species from feeding areas as personal watercraft, scenic air tours, and travel on the Going-to-the-Sun Road increased.

Regional threats to biological diversity would result from habitat fragmentation and degradation of important winter range outside the park to the east and south if development continued in these areas.

IMPACTS ON THE CULTURAL ENVIRONMENT

Impacts on Cultural Resources

Methods of Analyzing Impacts. The National Park Service completed a historic resources study in 1995 that examined over 360 structures in the park, identified and evaluated the historic properties of each, and determined whether they are eligible for listing on the National Register of Historic Places. The National Park Service also completed an archeological resources study in 1995 that identified over 400 archeological sites. These studies comprise a complete current inventory of known cultural resources inside the park.

Existing Management Zoning. The continued use of the management zones described in the 1977 *Master Plan* for Glacier National Park would not affect cultural resources in the park because no actions are recommended that would affect them.

Visitor Use of the Going-to-the-Sun Road — Increased use of the Going-to-the-Sun Road would not adversely affect cultural resources because use patterns would not change.

Preservation of the Going-to-the-Sun Road — Some of the Going-to-the-Sun Road's cultural resources would probably be lost during the 50-year construction period due to structural failure of the retaining walls and guardwalls before they could be repaired.

Preservation of Historic Hotels and Visitor Services — No action would result in eventual closures of hotels. Five buildings are recognized as national historic landmarks, so loss of the buildings or their integrity would be an adverse effect. An indirect effect would be that visitors would no longer be able to find lodging in the park. Staying in hotels in the park is a traditional and historic visitor activity that could be lost.

Scenic Air Tours — Scenic air tours would have no direct or indirect effect on cultural resources.

Personal Watercraft — PWC use on St. Mary Lake and Lake McDonald would have no direct effects on historic properties. However, the ambiance of the Lake McDonald historic district would be affected by the noise and visual intrusion of personal watercraft.

Winter Use — Unchanged winter use would not directly affect cultural resources. Indirectly, low or no use of buildings during winter months could lead to a certain amount of winter damage resulting from lack of use, changes in temperature, etc. With no action, historic buildings would continue to incur minor damage during winter and be repaired in spring.

Divide Creek Flood Hazard — Continued location of the facilities in the St. Mary developed area would eventually result in the loss of the St. Mary maintenance area historic district during a flood.

West Side Discovery Center and Museum — The continued use of the Apgar visitor contact station would not have a direct effect on cultural resources. Indirectly, visitors entering from the west would have less of an introduction to the historic properties in the park, and that would lead to less appreciation and less

funding for maintenance of historic buildings over time. Historic items that are now stored in three different areas would not be adequately protected. Additions to the collection could not be adequately stored onsite because of lack of adequate facilities.

Conclusion. Divide Creek would eventually catastrophically flood and destroy or severely damage the St. Mary maintenance area historic district. Some facilities, such as the Many Glacier Hotel, Lake McDonald Lodge, and Two Medicine Chalet (campstore), as well as the Going-to-the-Sun Road, would eventually have to be closed because they would become unsafe and much too expensive to maintain. Cultural resources would continue to suffer a low profile and the museum collection would continue to deteriorate due to the lack of adequate storage space.

Cumulative Impacts. Early 20th century grand hotels and cabin camps would be lost, which would result in a cumulative adverse effect on resources for those eras. The historic structures provide experiences of history and are genuine park resources that would be destroyed and lost. This would be a cumulative adverse effect.

Impacts on the Blackfeet and Salish and Kootenai Tribes

Regular consultation with the Blackfeet Tribal Business Council and the Flathead Cultural Protection Office would ensure that the tribes would not be adversely affected by any of the no-action alternatives.

IMPACTS ON THE SOCIOECONOMIC ENVIRONMENT

Method for Analyzing Impacts. Bioeconomics, Inc., of Missoula, Montana, was contracted in 1997 to conduct a socioeconomic impact analysis of the alternatives for the *Draft General Management Plan and Environmental Impact Statement*. The analysis relied largely on already available information from the National Park Service. A minimal amount of original data was collected, and an analysis was conducted with the use of IMPLAN (a socioeconomic modeling program).

The Institute for Tourism and Recreation Research of the School of Forestry at the University of Montana undertook an analysis of the economic impacts of the Going-To-The-Sun Road in 1998. That study, again relying on existing data, reported the economic impacts on the differing sectors of the state and regional economies.

Impacts on Regional and Local Communities

Existing Management Zoning. Continued management of the park using the management zones as described in the 1977 *Master Plan* would not adversely affect regional and local communities because no actions under the zoning scheme would affect regional or local communities.

Visitor Use on the Going-to-the-Sun Road — Negative economic impacts of continued reconstruction activity over 50 years would not be as great in any one year as it would for the other alternatives. Failures of the road that resulted in closure would have adverse effects on state and local economies. If the road failed these impacts could be greater in any one year than in any other alternative.

Preservation of the Going-to-the-Sun Road — All alternatives, including the no action alternative, call for the continued maintenance of the Going-to-the-Sun Road. Regardless of the alternative chosen, there would be periods when the road would be closed for rehabilitation and maintenance. The impact associated with this action would be a reduction in park visitation and cross-park travel, which would negatively impact local businesses and concessions. Offsetting this impact would be the contribution made to the local economy by the construction project itself. The degree of the impact would depend on the length of time the road was closed and the season of closure. The local and regional economy would be adversely affected if a catastrophic event closed the road. The effects would depend on the length of time the road was closed and how much of the road was closed.

Except in the periods when the road would have to be closed for construction, the regional and local economies would be unaffected by the no-action alternative for the Going-to-the-Sun Road. The economic benefits of travel and tourism associated with the Going-to-the-Sun Road would continue unchanged. Maintenance activities and periodic construction projects would continue and would contribute to the local and regional economies.

Preservation of Historic Hotels and Visitor Services — In the short term, little change to the local and regional economies would result from the no-action alternative for lodging and overnight visitor services. The inventory of park accommodations would not change. In the longer term, without upgrading, some park lodging would have to be closed for public safety reasons. Revenue loss would impact the concessioner and would have the potential to cause business failures if enough of the rooms or other services were lost. Depending on the number of units lost, this could have a large impact on the local economy and a noticeable impact on the regional economy. According to the economic analysis undertaken by Bioeconomics, Inc., the worst case estimate of annual losses to the local and regional economies would be \$8.9 million and 599 jobs. The loss in total industrial output was estimated at \$20.7 million. Their worst case estimate considered that all park lodging would eventually be closed and that all overnight visitors consequently would not visit the park.

Scenic Air Tours — There would be no adverse economic impact as a result of the no-action alternative for scenic air tours.

Personal Watercraft — PWC use would be permitted on certain lakes, which would result in a slight increase in visitor spending. This impact was characterized as negligible by Bioeconomics, Inc.

Winter Use — There would be no adverse economic impact as a result of the no-action alternative for winter use.

Divide Creek Flood Hazard — At Divide Creek, the economic impact on the local economy (and to a lesser extent on the regional economy) as a result of tak-

ing no action is difficult to predict. If major flooding occurred, rebuilding costs associated with replacing housing, maintenance, and administration facilities would contribute to the local economy for the lifetime of the construction project. If flooding did not take place, the no-action alternative would have no impact. Continued manipulation of the stream threatens property outside the park, since it has been manipulated to avoid park structures.

West Side Discovery Center and Museum — There would be no adverse economic impact as a result of the no-action alternative for the Apgar visitor contact station.

Conclusion. The contribution Glacier National Park makes to the local economy and the economy of the region would continue since the park would remain a significant national attraction. The potential loss of some lodging in the long term would be a significant negative impact. The lodge closures could result in a major negative economic impact by reducing the numbers of visitors attracted and the resulting spending.

Cumulative Impacts. When examined in the context of the economy of northwestern Montana the no-action alternative is the only alternative with a negative cumulative economic impact due to the potential loss of lodging inventory. Bioeconomics, Inc., however, found that any change due to implementation of the no-action alternative for preservation of historic hotels and visitor services would have a minor impact on the overall robust economy of the region.

Impacts on Local and National Visitors

Existing Management Zoning. Continued use of the management zones as described in the 1977 *Master Plan* for Glacier National Park would not adversely affect local and national visitors because no actions under the zoning scheme would affect them.

Visitor Use on the Going-to-the-Sun Road — The Going-to-the-Sun Road would continue as the primary attraction for the national visitor and would continue to provide access to the multiple attractions of Glacier for all visitors. If the trend toward increasing visitation continued, congestion would increase and visitor enjoyment and satisfaction would diminish. Logan Pass would continue to be congested during peak periods but would continue to provide a range of services to the visitor, including book sales, restrooms, exhibits, and shelter from the elements.

Preservation of the Going-to-the-Sun Road — Continued maintenance of the Going-to-the-Sun Road would spread the repair work out over a 50-year period. This long-term repair process would be less of a disruption to visitor use during any one year than a large reconstruction project. However, disruption in visitor use would continue over a much longer time than in the other alternatives. It is also expected that there would be periodic unscheduled closures of the road resulting from failures such as the collapse of retaining walls and damage due to poor drainage. Visitor safety would be at risk.

Preservation of Historic Hotels and Visitor Services — Overnight lodging would continue to be available, but in the long term the closure of some facilities might become necessary for safety reasons. The scope of the impact would depend on the scale of the inventory lost but could be significant. Bioeconomics, Inc., has characterized the closures as a potential major negative impact on the numbers of visitors attracted to Glacier National Park.

Scenic Air Tours — Increased scenic air tours would have an adverse impact on many visitors to Glacier National Park because of the increased noise levels and the visual effects of the machines in an area that is valued for its quality wilderness experiences. These impacts would be especially severe for backcountry users.

Personal Watercraft — Under the no-action alternative the use of personal watercraft would again be permitted where other motorized craft of more than 10 hp are allowed. This would benefit visitors who want this form of recreation. For others seeking a quieter experience, there would be a negative impact. Continued PWC use also would cause safety problems. While personal watercraft make up only about 11 percent of the watercraft registered in the United States, they comprise over 35 percent of the vessels involved in accidents; 44 percent of boating injuries reported in 1996 involved personal watercraft (National Association of State Boating Law Administrators 1996).

Winter Use — Winter use would not affect local or national visitors.

Divide Creek Flood Hazard — There would be no impact on local or national visitors as result of no action at Divide Creek except during floods when access would be temporarily limited or removed.

West Side Discovery Center and Museum — Visitors would continue to experience difficulties with information services and orientation due to the lack of an adequate west side visitor center. The current conditions would continue, and the Apgar visitor contact station would remain inconvenient and congested.

Conclusion. Local and national visitors would be significantly adversely affected by increased scenic air tours, extended delays due to long-term construction on the Going-to-the Sun Road, and eventual loss of the hotels and lodges in the park. Local and national visitors would also be significantly adversely affected by continuing the use of the inadequate and poorly located visitor contact station in Apgar. Allowing personal watercraft in the park would adversely affect local and national visitors seeking a traditional experience in Glacier.

Cumulative Impacts. Glacier National Park would continue to be a significant attraction in the mix of resources of northwestern Montana. The potential loss of lodging capacity in the park would be expected to have only a modest impact on the regional tourism industry given the quantity of lodging available near the park. Long-term reconstruction of the Going-to-the Sun Road and potential catastrophic failure, combined with the reconstruction of major roads outside the park, would cumulatively adversely affect local and national visitors as they visit the region.

Impacts on Energy Consumption

Methods for Analyzing Impacts. A causal relationship was examined to determine changes in energy consumption as a consequence of development actions.

Existing Management Zoning. Continued use of the management zones as described in the 1977 *Master Plan* for Glacier National Park would not affect energy consumption in the park.

Visitor Use on the Going-to-the-Sun Road — No change in energy consumption would result from the no-action alternative. The Going-to-the-Sun Road would continue to be the principal travel corridor for visitors, and personal vehicles would continue to be the primary transportation method.

Preservation of the Going-to-the-Sun Road — Reconstruction of the Going-to-the-Sun Road would not significantly increase energy consumption in the park.

Preservation of Historic Hotels and Visitor Services — Since the lodging inventory would not change in the short term, there would not be any impact on energy consumption. In the long term, if lodges were closed for safety reasons, there would be a net reduction in energy consumption.

Scenic Air Tours — Anticipated increased scenic air tour activity would impact energy consumption and result in an increase over time.

Personal Watercraft — The use of personal watercraft would again be permitted on certain lakes and would modestly increase energy use.

Winter Use — The winter use component of the no-action alternative would not impact energy consumption.

Divide Creek Flood Hazard — Divide Creek would have no effect on energy consumption under this alternative.

West Side Discovery Center and Museum — No action would be taken on the west side discovery center and museum, so there would be no change on energy consumption.

Conclusion. Energy consumption would increase slightly from the anticipated increases in scenic air tours and from allowing personal watercraft in the park.

Cumulative Impacts. While visitation continued to grow with time, the cumulative impact of the no-action alternative would be negligible.

Impacts on Environmental Justice

Existing Management Zoning. Continued use of the management zones as described in the 1977 *Master Plan* for Glacier National Park would not adversely affect environmental justice because no actions are called for that would affect minority populations disproportionately. The no-action alternative would not disproportionately adversely affect minority or low income populations because the actions recommended would affect all populations equally.

Conclusion. Little impact would result in regard to day use and the ability of visitors to gain access to the attractions of Glacier. The significant impact would

relate to overnight use in the park and would depend on the extent of lodging closures.

Cumulative Impacts. There would be no cumulative impacts on environmental justice.

Impacts on Landowners in the Park and Adjacent to the Boundary

Method for Analyzing Impacts. The 1985 *Land Protection Plan* for the park was consulted, as were maps showing private land in and adjacent to the park.

Existing Management Zoning. Continuing to use the management zones as described in the 1977 *Master Plan* would not adversely affect private landowners in or outside the park. The zoning scheme does not call for any action that could affect landowners in the park.

Visitor Use on the Going-to-the-Sun Road — Owners of private lands in or adjacent to the park would not be adversely affected by increased visitor use of the Going-to-the-Sun Road, but increased congestion could slow access to private properties in the park.

Preservation of the Going-to-the-Sun Road — Reconstruction of the Going-to-the-Sun Road would not adversely affect owners of land in or adjacent to the park because most construction would take place in the higher elevations where there is no private land.

Preservation of Historic Hotels and Visitor Services — Landowners in and outside the park would not be adversely affected by continued maintenance of the hotels and lodges and other visitor services.

Scenic Air Tours — Owners of land inside the park boundary and adjacent to the boundary would be adversely affected by anticipated increases in scenic air tour activity because of increased noise levels and visibility of aircraft.

Personal Watercraft — People who own land on Lake McDonald would be adversely affected by personal watercraft use due to the increased noise on the lake. Landowners who want to use personal watercraft would not be adversely affected and lifting the ban would have a positive impact.

Winter Use — Owners of lands inside or outside the boundary would not be affected by continuing levels and types of winter use.

Divide Creek Flood Hazard — Owners of land inside or outside the boundary would not be affected by continued use of the development adjacent to Divide Creek.

West Side Discovery Center and Museum — Owners of land inside or outside the boundary would not be affected by continued use of the visitor contact station in Apgar.

Conclusion. Owners of land in the park would be adversely affected by increased scenic air tours in the park and by personal watercraft on Lake McDonald. Owners of land outside the park adjacent to the boundary would be adversely affected by increased scenic air tours.

Cumulative Impacts. There would be no cumulative impacts.

Impacts of All the Preferred Alternatives

IMPACTS ON THE NATURAL ENVIRONMENT

Impacts on Water Resources, Including Water Quality, Floodplains, and Wetlands

Management Strategy. Implementation of the management strategy would have a positive effect on water resources because approximately 95 percent of the park would be managed as a wild area. Therefore, the majority of water resources in the park would be managed in their natural state with no disturbance or development. Water reservoirs located in visitor service zones (less than 5% of the park) would be protected from adverse effects by the use of state of the art technology and mitigate any ground disturbance. The major developed areas would not be expanded beyond their zones.

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. If the study recommended additional pullouts, the following effects could occur. Modification of existing or construction of additional pullouts, picnic areas, short trails, and interpretive sites at such areas as Moose Country, Lunch Creek, Logan maintenance pit, Sunrift Gorge, Sun Point, and Packers Roost would result in minimal short-term adverse impacts on water quality from construction activity in the area. Mitigating measures such as silt fencing and revegetation would prevent sediment from entering the adjacent creeks and rivers. After construction was complete, there could be minimal direct and indirect adverse impacts on water quality from sheet drainage from the road, which would release contaminants such as oil from vehicles into the creek and rivers adjacent to the road and pullouts.

Development would not occur in wetlands near Moose Country and Avalanche to avoid adversely affecting wetlands. There would be no direct or indirect adverse impacts from dredging or filling wetlands or water bodies associated with this alternative. Restroom facilities, roads, trails, and picnic areas are allowed in floodplains and are excepted from compliance with Executive Order 11988. If the study recommended visitor use limits, there would be no additional effects on water resources, water quality, floodplains, or wetlands.

Preservation of the Going-to-the-Sun Road — Construction activities would disturb soils, which could affect water resources. Riparian wetlands adjacent to the road could also be affected by construction activity. Without mitigation to protect streams, wetland lakes, and rivers adjacent to the Going-to-the-Sun Road, water quality would be adversely affected by increased sediment and turbidity. With mitigation in place, water quality would be protected. Prior to road construction an Army Corps of Engineers 404 permit as defined by the Clean Water Act and state permits would be obtained. Compliance with section 401 of the Clean Water Act would be conducted to determine appropriate mitigation to protect water quality. These permits define the activity to take place and the mitigation that would be required to protect water quality.

Preservation of Historic Hotels and Visitor Services — These actions could have short-term impacts on the water quality of lakes and creeks from sedimentation as a result of ground disturbance. These impacts would be mitigated by the installing erosion control devices (such as hay bales and plastic barriers) before construction could begin and by revegetation following construction. No known wetlands would be adversely affected by this action.

Scenic Air Tours — The ban would have no impact on water resources, including water quality, floodplains, and wetlands, because there would be no new ground disturbance.

Personal Watercraft — Making the temporary ban on personal watercraft permanent would protect water resources from accidental spills of petroleum products and emissions by removing a potential source of contamination. Wetlands associated with the large lakes in the park would also be protected from adverse effects by permanently banning personal watercraft. Floodplains would not be affected by this ban because personal watercraft are not used in floodplains.

Winter Use — This alternative would have no significant adverse effect on water quality, floodplains, or wetlands because there would be no new ground disturbance.

Divide Creek Flood Hazard — Relocating the administrative, maintenance, and housing facilities out of the Divide Creek flood hazard zone in St. Mary would have a positive impact on water quality and the flood hazard area because flood abatement measures would no longer be necessary. Relocating the maintenance facility would remove the hazardous and toxic substances now located in the 100-year floodplain and would eliminate the danger of contamination by these substances during a flood. NPS policy requires that these facilities be located outside 500-year floodplains. Relocating employee housing and administrative facilities would remove household and office contaminants and sewerlines from the floodplain and would eliminate the possibility of their being released into the water during a flood.

West Side Discovery Center and Museum — There would be no adverse impacts on water quality, floodplains, or wetlands from the construction of a west side discovery center and museum near the T-intersection because the proposed location is not within or near a floodplain or wetland and because erosion prevention measures would prevent siltation of nearby water bodies.

Conclusion. Overall there would be minimal adverse impacts on water quality as a result of these alternatives. There would be no adverse impacts on floodplains or wetlands. There would be benefits to water quality and floodplains.

Cumulative Impacts. Removing NPS development near Divide Creek should provide better protection of adjacent landowner property because manipulation of the streambank by the park would close. This action could also have a positive effect on adjacent landowners by reducing the danger of flooding, because if the stream is allowed to follow its natural course it would be more likely to flood inside the park boundary, and thus adjacent landowners would not have to manipulate the creek to protect their property.

Impacts on Scenic Resources

Management Strategy. Implementation of the management strategy would result in a positive effect on scenic resources because over 95 percent of the park would be managed as a wild area, and not developed. Developed areas would not expand beyond visitor use zones and any additional development would blend in and not adversely affect scenic views.

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. If the study recommended additional pullouts, the following effects could occur. There would be some change in the scenery adjacent to the road from the modification of existing or development of additional pullouts, picnic areas, trails, and interpretive sites at areas such as Moose Country, Lunch Creek, Logan maintenance pit, Sunrift Gorge, and Sun Point. Facilities would be designed to blend in with the vegetation and surrounding landscape so that they would not stand out and detract from the scenery. If the Logan maintenance pit was developed as a parking area for the public transportation system, there could be a direct adverse impact on the scenic resources in that area. However, this area is well screened from the road and site design would ensure that that this parking area would continue to be screened from the Going-to-the-Sun Road. The parking area would be visible from portions of the Going-to-the-Sun Road above the Loop, from a portion of the highline trail, and from Heaven's Peak. The Logan maintenance pit would also be visible from off-trail locations to the north, south, and east. This would result in an adverse effect on the scenic views from these locations.

Preservation of the Going-to-the-Sun Road — There could be temporary localized adverse effects on scenic resources during reconstruction, but there would not be permanent effects.

Preservation of Historic Hotels and Visitor Services — Rehabilitation of the lodges would not result in any adverse effects on scenic resources because this activity would be confined to existing, historic property and would not change their setting or character. The Many Glacier developed area is only visible from a few trail locations above the valley floor and does not dominate the view. There would be some minor localized visual disturbance in the areas where repairs were being done.

Scenic Air Tours — Aircraft are a visual intrusion into the natural scene and adversely affect the scenic resources of Glacier. Banning air tours would have a positive effect on scenic resources throughout the park because aircraft are a visual intrusion. Natural and cultural views would be restored. If air tour operators replaced tours over the park with new tours over areas adjacent to the park, there might be impacts on scenic resources over the Bob Marshall Wilderness complex, the Badger-Two Medicine area, the Blackfeet Indian Reservation, and the Whitefish Range.

Personal Watercraft — There would be no adverse impacts on scenic resources from a permanent ban on the use of personal watercraft in the park.

Winter Use — There would be no effects on scenic resources from expanded day use during the winter in Glacier.

Divide Creek Flood Hazard — Relocating development from the Divide Creek floodplain would have a positive impact on scenic resources in that area; however, further analysis would have to be completed to determine the effects on scenic resources in the areas where the development is moved.

West Side Discovery Center and Museum — Construction of a west side discovery center and museum near the T-intersection would not adversely affect scenic resources. Panoramic views would not be altered, but the views along the road would change. The facility would be designed to blend into the natural scene.

Conclusion. There would not be any permanent adverse impacts on scenic resources from these actions.

Cumulative Impacts. There would be no cumulative impacts.

Impacts on Aquatic Resources, Including Federally Listed Species

Management Strategy. The management strategy would have a positive effect on aquatic resources in the park because over 95 percent of the park would be managed as a wild area and aquatic reservoirs would not be manipulated. Aquatic reservoirs within the developed areas would be protected within that zone by mitigation. The developed areas would not be expanded beyond the visitor service zone.

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. The following effects could occur. Aquatic resources could be adversely affected by building pullouts, picnic areas, and trails in areas where there is no current use. Increasing use in these areas and increasing visitation could directly affect aquatic resources such as bull trout, westslope cutthroat trout, and the capshell limpet if people using streambank areas increased siltation. If additional pullouts, picnic areas, and short trails were constructed, mitigation to prevent increased siltation would protect aquatic resources. Without mitigation, runoff would be increased during the construction period. Small soil particles that do not settle readily reduce light penetration and hinder the growth of aquatic plants and the activities of sight-feeding fish. High concentrations can clog the gills of aquatic animals and interfere with respiration. Larger soil particles that settle in high concentrations

can smother bottom-dwelling organisms and fish eggs. Chronic low level sedimentation can have significant adverse effects on aquatic resources by reducing the diversity and amount of habitat available for aquatic insects and spawning. Mitigation such as revegetation would be conducted to prevent adverse effects on the federally listed bull trout, proposed capshell limpet, and the state-rare westslope cutthroat trout. Further consultation with the U.S. Fish and Wildlife Service during design would ensure protection of these species. Limitations on visitor use could benefit aquatic species by reducing the number of people using streamside areas, damaging vegetation and increasing sedimentation.

Preservation of the Going-to-the-Sun Road — During reconstruction of the Going-to-the-Sun Road mitigation would be used to reduce the impacts on aquatic resources. Without mitigation, aquatic resources could be adversely affected by increased sediment and accidental spills of petroleum and other chemical products. The impacts of sedimentation and increased turbidity on rivers and streams would be minimized during reconstruction by erosion control measures. Proper construction management procedures would be used to prevent contamination of adjacent rivers and streams from accidental petroleum spills by construction equipment. Revegetation following construction would reduce runoff.

Preservation of Historic Hotels and Visitor Services — Aquatic resources would be temporarily adversely affected during rehabilitation of the Many Glacier Hotel, Lake McDonald Lodge, and Rising Sun areas. Mitigation would be used to control the amount of sediment entering rivers, streams, and lakes in these areas.

Scenic Air Tours — Banning scenic air tours would have no impact on aquatic resources because the aircraft do not land in the park.

Personal Watercraft — A permanent ban on personal watercraft in the park would positively affect aquatic resources by protecting them from the adverse effects of personal watercraft.

Winter Use — Increased day use during the winter would not adversely affect aquatic resources because of the nature and extent of the activity.

Divide Creek Flood Hazard — Moving the development from the Divide Creek floodplain would have a positive effect on aquatic resources by removing activity from that area, and because flood abatement measures to control the creek would no longer be taken. This would allow the creek to be restored to its natural state and to follow its own course, which would improve habitat for aquatic resources.

West Side Discovery Center and Museum — Development of a new west side discovery center and museum near the T-intersection would not adversely affect aquatic resources because none are in the area that would be disturbed.

Conclusion. Removal of the development from the Divide Creek floodplain would all have a positive effect on aquatic resources. Construction activities could have an adverse effect, but mitigating measures would be taken to ensure protection of aquatic resources, including the bull trout, cutthroat trout, and capshell limpet. If visitor use was increased in previously undisturbed or little used areas, it could have an adverse effect. Managing visitor use through a comprehensive use plan for the Going-to-the-Sun Road would have a positive effect on aquatic resources.

Cumulative Impacts. There would be no cumulative impacts on aquatic resources.

Impacts on Soils

Management Strategy. The management strategy would not adversely affect soils throughout the park because over 95 percent of the park would be managed as a wild area. Therefore the majority of soils in the park would not be disturbed. Soils in trail corridors and backcountry campsites would be compacted due to use and primitive developments. The major developed areas would not be expanded beyond the visitor use zones. Soils in these zones have already been disturbed, so any additional use and development would not have an adverse effect on soils.

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. The following effects could occur depending on the outcome of that planning effort. The development of additional pullouts, picnic areas, restrooms, a large parking area at Logan maintenance pit, and short trails along the Going-to-the-Sun Road would result in adverse impacts on soils. There would be soil compaction at all sites developed for visitor use, and development would remove them from production of natural vegetation. Soils throughout the road corridor are moderately susceptible to weed invasion. Soils on the east side are more subject to erosion than on the west side, so during construction soils would be adversely impacted by erosion on the east side unless mats for stabilization, immediate revegetation, and other mitigation measures were used. The shallow soils in the Lunch Creek area would make revegetation and control of erosion critical during construction. These soils are suitable for trail development. The soils on the west side of Logan Pass are moderately suitable for waste disposal such as septic tanks; however, in the Road Camp area on the west side, the soils are shallow with a low water-holding capacity. On the east side of the pass soils are not suitable for waste disposal in the higher elevations due to the shallow depths and low rock content. Soils in the lower elevations on the east side around St. Mary Lake are moderately suitable for waste disposal. Limiting visitor use could benefit soils by reducing the compaction caused by visitors in areas adjacent to the road.

Preservation of the Going-to-the-Sun Road — The effects of reconstructing the Going-to-the-Sun Road would be similar to those in the no-action alternative.

Preservation of Historic Hotels and Visitor Services — Reconstruction of the hotels and visitor services in the park would have negligible impacts on soils because most of the soils in the developed area have previously been disturbed. The reconstruction work would primarily be confined to the structures themselves.

Scenic Air Tours — There would be no impacts on soils from scenic air tours because the aircraft do not land in the park.

Personal Watercraft — Banning personal watercraft permanently from all park waters would not affect soils.

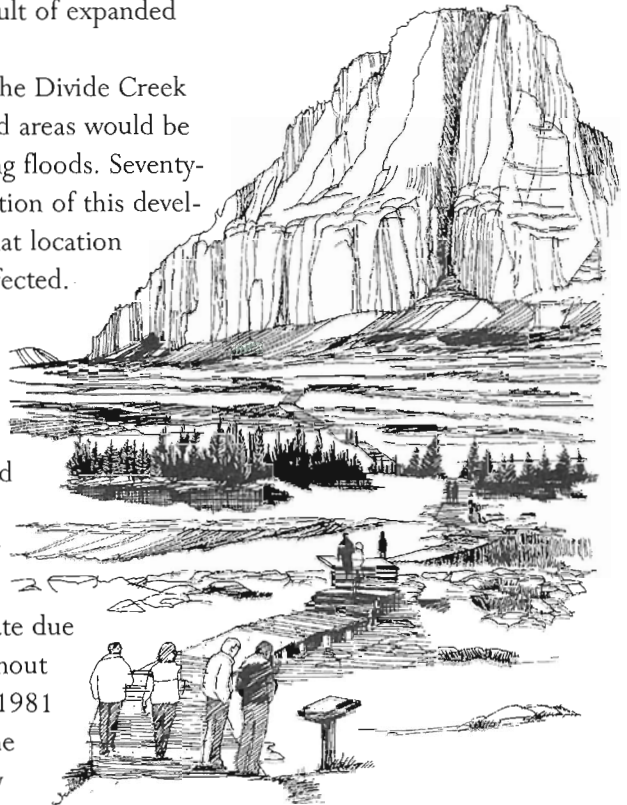
Winter Use — There would be no impacts on soils as a result of expanded winter day use because soils are covered by snow in winter.

Divide Creek Flood Hazard — Removing development in the Divide Creek area would have a positive impact on soils. Previously compacted areas would be restored, increasing the ability of the soils to absorb water during floods. Seventy-seven acres of soils would be restored to productive use. Relocation of this development could adversely affect soils at the new location. Until that location can be selected, it is not known what kinds of soils would be affected. Further analysis would have to be done after the location was identified. The cessation of flood abatement activities would eliminate another cause of soil disturbance.

West Side Discovery Center and Museum — Construction of a west side discovery center and museum would adversely impact soils near the T-intersection by removing them from production. These soils are very susceptible to invasion by weeds when disturbed. If a new sewage treatment system was required to serve this facility, certain areas would not be adequate due to varying degrees of silt loam and rock content present throughout the area of the T-intersection. According to information in the 1981 Apgar Headquarters Area Environmental Assessment, soils to the west and east of the T-intersection are less suitable because they are loamy and have relatively low percolation rates and load-bearing capacities. Soils north of the T-intersection are better suited for construction of a visitor facility because of the low water table. According to the May 1995 soil survey, the area rated from low to moderate for septic systems.

Conclusion. Impacts on soils would not be significantly adverse provided that mitigation was carried out during construction to prevent invasion by exotic species and reduce erosion and the resulting loss of soil. There would be some local disturbance if additional roadside pullouts were developed and also at the T-intersection.

Cumulative Impacts. There would be no cumulative impacts as a result of these actions.



Impacts on Vegetation, Including Species at Risk and State-Rare Plant Species

Species at Risk.

Management Strategy. The management strategy would have a positive effect on vegetation in the park because over 95 percent of the park would be managed as a wild area. Therefore the majority of the park's vegetation would not be disturbed except along trail corridors and backcountry sites. Vegetation in the areas would continue to be removed or trampled due to use and maintenance of trails and primitive developments. Developed areas would not expand beyond the visitor service zones. Vegetation in those areas would be affected by routine maintenance.

There could be adverse effects on vegetation in day use zones under the new management strategy. Some areas might change when use required widening trails and sanitation and similar facilities outside of developed areas. Further analysis would be conducted when more specific changes were identified. These would not be expected to be significant impacts.

The management strategy would not have an adverse effect on species at risk or state-rare plant species throughout the park, because actions would be taken to protect these species.

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. The effects would depend on the action chosen. If pullouts were added, modifying existing or constructing additional pullouts, picnic areas, and trails along the Going-to-the-Sun Road would not affect any known population of rare plants; however, additional use at these areas could have adverse impacts. Mitigation, such as changing the location of a pullout, modifying design, or limiting the areas open to visitors outside the developed area, would reduce adverse effects. Alpine glacier poppy and lens fruited sedge (species at risk) and three-flowered rush, little false asphodel, Mingan Island moonwort, lyre-leaf rockcress, and northern eyebright (state-sensitive species) could be affected. Each area would be surveyed prior to development of a site design to ensure that all plant locations were noted. The site design would avoid all known rare plants. As a last resort, rare plants that could not be avoided would be moved to suitable and similar habitat nearby. These actions would ensure that there would not be significant adverse impacts on rare plants. Marking the plant locations during construction would protect these species from accidental trampling. Decreasing visitor use would have beneficial effects.

Preservation of the Going-to-the-Sun Road — The same plants could be adversely affected by the reconstruction of the Going-to-the-Sun Road, as in the no-action alternative. Mitigation would be implemented to avoid adversely affecting these plants. It could include either marking the site to be avoided or, as a last resort, relocation of the plants to similar habitat. Transplanting of rare species has not been done at Glacier. The success rate of this mitigation would have to be evaluated further.

Preservation of Historic Hotels and Visitor Services — No known rare plant species would be adversely affected by the rehabilitation of the lodges. If new development was begun in the Many Glacier Valley or Lake McDonald historic district, the sites would be surveyed during the design phase to determine if any plants of concern were there. If they were found, the design would be modified or the plants would be relocated to similar habitat.

Scenic Air Tours — No species at risk or state- and park-rare plant species would be adversely impacted by banning scenic air tours.

Personal Watercraft — Rare plants would be protected from potential adverse impacts by the ban on personal watercraft. This action would contribute to protection of rare plants in the vicinity of Lake McDonald and St. Mary Lake because it would protect them from damage inflicted in shallow water by these machines.

Winter Use — No species at risk or state- and park-rare plant species would be adversely impacted by day use during the winter.

Divide Creek Flood Hazard — No species at risk or state- and park-rare plant species would be adversely impacted by the removal of the administrative, maintenance, and employee housing facilities at St. Mary in the floodplain of Divide Creek.

West Side Discovery Center and Museum — The construction of this facility could impact the rare velvetleaf blueberry. This impact would be mitigated by design or, as a last resort, relocation. No other species at risk or state- and park-rare plant species would be adversely impacted by construction of the west side discovery center and museum.

General Vegetation

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. If additional pullouts were recommended, the following effects could occur. Approximately 0.25 acre of vegetation per site along the road would be removed or adversely impacted for development (pullouts, trails, and picnic areas), but this would not be a significant adverse impact. The amount of vegetation would vary by the size of the site depending on the parking capacity, type of activity, resources at the site, the vegetation and soil conditions, and the degree of development already in place at each of the sites. Vegetation may be affected outside the immediate area as a result of social trails. Each area would be examined for trail development potential to minimize social trail development. Visitors would be instructed to remain on established trails. Vegetation along the road would be positively impacted by controlling the amount of trampling and damage that was done by visitors who stop on the side of the road. Since Logan maintenance pit is an already disturbed area and largely cleared of vegetation, vegetation would be minimally adversely impacted. Limiting visitor use would benefit vegetation by reducing the amount of roadside vegetation trampling.

Preservation of the Going-to-the-Sun Road — Some vegetation would be adversely affected along the Going-to-the-Sun Road during reconstruction, but this would probably not be significant. This loss of vegetation could be mitigated by restoration of all locations along the road that were adversely affected by construction.

Preservation of Historic Hotels and Visitor Services — Preservation of the national historic landmarks and national register properties that are operated by a concessioner should not adversely impact vegetation in the developed areas.

Scenic Air Tours — There would be no adverse impacts on vegetation as a result of banning scenic air tour activity because the aircraft do not land in the park.

Personal Watercraft — Permanently banning personal watercraft would not adversely affect rare plants or vegetation.

Winter Use — There would be no adverse impacts on vegetation as a result of providing for day use during the winter because no ground disturbance will occur and plants are dormant. The use would take place on existing roads and on snow.

Divide Creek Flood Hazard — Further analysis would have to be completed to identify new locations for the Divide Creek facilities. After the facilities were removed from the Divide Creek area, the site (approximately 77 acres) would be revegetated, resulting in a positive effect.

West Side Discovery Center and Museum — Vegetation, including lodgepole, spruce, and cedar, shrubs, forbs, and annuals would be removed to accommodate a new discovery center and museum. Ground disturbance and other construction-related activity would, for the short term, increase the chances for the introduction and spread of noxious weeds and other exotic plants. By creating new development at the site, unstable trees and hazard trees would be taken out, which would affect the diversity of the vegetation and change the forest composition and structure, possibly affecting nesting habitat.

Vegetation would be adversely affected by trampling by more visitors in the area. Construction of trails and designated viewing areas would decrease the amount of off-road trampling.

Conclusion. If the comprehensive use plan recommended the development of pullouts or modifications of existing pullout areas, this would result in loss of vegetation along the Going-to-the-Sun Road, but it would not be a significant adverse impact if the areas were already devoid of vegetation. The positive effect of this action would be a reduction of unmanaged off-road parking. By concentrating use at some of these pullouts or at a few designated trails, the proliferation of social trails would be reduced. Development in areas that have rare plant populations could adversely affect these resources. Mitigating measures such as avoiding the plants in these areas or replanting them in suitable habitat would be necessary. Where there were rare plants near or at natural stopping points for visitors, development could have a positive impact because trails would be designed to avoid the plants. Trampling of vegetation would be eliminated by providing trails to guide visitors away from rare plant locations. Any new development would result in the removal of hazard trees, which could affect forest community integrity.

Preservation of the national historic landmark overnight facilities and national register properties would not adversely impact vegetation or rare plant populations. However, if additional overnight accommodations were constructed in the Lake McDonald, Many Glacier, and Apgar areas, rare plant populations could be significantly adversely impacted. The plants would have to be relocated or the facilities would have to be sited and constructed in a way that would avoid harm to these plants.

Revegetation of 77 acres in the St. Mary headquarters area would have a positive impact on vegetation.

Cumulative Impacts. There would be no cumulative impacts.

Impacts on Wildlife, Including Federally Listed Threatened and Endangered and State-Rare Species

Management Zoning. The management strategy does not propose to expand development beyond the existing visitor service zones. The majority of the park would be maintained as a wild area. The emphasis would be on maintaining natural processes. Therefore, there would be no additional effects on wildlife, including threatened and endangered and state-rare species. Most of the valley bottoms are important habitat for wildlife, including grizzly bears. Areas adjacent to visitor service zones would be managed in favor of wildlife, resulting in a positive effect.

Bald Eagles.

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. The following effects could occur, depending on the recommendations of the comprehensive use plan. The removal of trees and other vegetation for the development of pullouts, picnic areas, and short trails along the east shore of Lake McDonald and the north shore of St. Mary Lake could result in the loss of eagle foraging habitat by removing perch trees and screening vegetation. A park wildlife biologist would participate in the site selection and design of these developments to avoid known foraging or roosting areas and minimize impacts on eagles. Informal pullouts (created by visitors without regard to potential eagle use) would be obliterated.

Operation of an expanded transportation system would not adversely affect bald eagles. Any additional parking facilities would not be located in known bald eagle nesting, foraging, or roosting areas.

As visitor use increased along the Going-to-the-Sun Road, more visitor use could occur in eagle habitat (such as along lakeshores), and the disturbance of bald eagles could increase. Nest site management plans, visitor use restrictions, and education efforts would be implemented to minimize these impacts.

Preservation of the Going-to-the-Sun Road — Reconstruction of the Going-to-the-Sun Road would primarily occur along the higher elevations outside eagle habitat. Reconstruction of the lower sections of the road could temporarily displace eagles depending on the location and the time of year of construction. No construction activity would occur within 0.5 mile of known nest sites but would occur within the larger home range of each nest as well as in foraging habitat. Restricting construction activities to certain times of the year and specific times of day would mitigate impacts. Restrictions on construction activity would be imposed during sensitive nesting periods to avoid adverse effects.

Preservation of Historic Hotels and Visitor Services — Bald eagles would not be adversely affected by the reconstruction of the Many Glacier Hotel and other visitor facilities. There are no known nest sites in the Many Glacier Valley, but bald eagles are occasionally observed in the valley, and nesting has been suspected. Should nesting be confirmed, a nest management plan would be developed to pro-

tect the site and mitigation would be developed to avert adverse impacts. Ongoing maintenance of historic visitor service facilities has the potential of disturbing eagles that are nesting and feeding in the Lake McDonald area. Monitoring would be continued and mitigation developed if necessary.

Scenic Air Tours and Personal Watercraft — Banning personal watercraft and scenic air tours throughout the park would have a positive effect on bald eagles by decreasing the potential for human disturbance.

Winter Use — Providing winter use opportunities at Lake McDonald and St. Mary Lake would increase the number of visitors in this area during the most sensitive time of the eagle nesting period (March-May) as well as during the stressful winter period. Human disruption of early nesting activity and incubation would increase the chances of nest abandonment or failure. Increased visitor use would also increase disturbance or displacement of birds during critical winter and migration periods. Visitor use restrictions, including temporary site- and time-specific closures, would be implemented.

Divide Creek Flood Hazard — Removal of the administrative and maintenance facilities and employee housing from the floodplain of Divide Creek in St. Mary could have some beneficial effects if bald eagles began to forage along Divide Creek. Depending on where the new facilities were relocated, bald eagles could be affected. Further analysis would be conducted after the potential facility relocation sites were identified.

West Side Discovery Center and Museum — Construction and operation of a west side discovery center and museum would not adversely affect bald eagles. This visitor facility would be farther away from eagle use areas along the Lake McDonald lakeshore and outlet than the current Apgar contact station. Actions would still be taken during critical use times to minimize impacts from human activity in those areas.

Gray Wolves.

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. If additional pullouts were recommended, the following effects could occur. Direct and indirect effects on wolves from increased opportunities (pullouts, short trails, picnic areas, and transportation system parking) along the Going-to-the-Sun Road in the St. Mary Valley, where there is evidence that wolves are recolonizing. Increasing development along this road could displace elk that feed in the meadows. This could in turn reduce prey availability if prey numbers declined as a result of lost foraging opportunities in productive meadow areas or if animals were displaced to areas outside the park, where they could be killed by hunters. It is anticipated that displacement effects would be minor and that elk would habituate to increased use. However, a review of case incident reports that include information about this elk population indicates that this particular population would be unlikely to habituate. If elk and deer became habituated, they might be less vulnerable to wolf predation because wolves are less likely to habituate to increased

human use; therefore, the habituation of ungulates could result in reduced prey availability.

Additional developments would be limited in their placement, would primarily use already popular use areas along the road, and would not be sited in meadows or riparian areas. A park wildlife biologist would participate in the site selection and design of these developments to minimize impacts on wildlife. Limits on visitor use could have beneficial effects on wolves.

Preservation of the Going-to-the-Sun Road — Reconstruction of the Going-to-the-Sun Road could temporarily displace wolves and prey species near construction, although most of the reconstruction would take place outside of known wolf habitat. Wolves in less used areas of the park could be adversely affected if visitors were displaced from the Going-to-the-Sun Road corridor during construction and temporarily began using other areas of the park.

Preservation of Historic Hotels and Visitor Services — Rehabilitation of the Many Glacier Hotel and other visitor facilities could temporarily displace wolves and prey species near construction sites, although most of the reconstruction would occur outside of known wolf habitat. The wolves would temporarily avoid the building areas during reconstruction.

The area surrounding the Many Glacier development is wolf habitat, and wolves frequent this area after the facilities are closed in the fall and visitation drops. Construction activity in this area in any season except summer would temporarily displace wolves.

Scenic Air Tours and Personal Watercraft — Banning scenic air tours (especially helicopters) and personal watercraft would be beneficial for wolves by decreasing the potential for human disturbance.

Winter Use — Winter day use visitation in the Many Glacier, St. Mary, and the lower portions of the North Fork Valley is generally low but is expected to increase. A larger increase would be expected than under the no-action alternative because of more consistent plowing of access roads. Wolves tend to avoid humans and areas near high use roads and development. With gradually increasing day use, primarily along roads and trails, wolves would probably avoid access roads and ski trails, at least when people were present, but would probably still use the general area if prey were available.

Ungulate wintering habitat exists in the valleys inside and outside the park. Increased human presence could affect prey species distribution and abundance. Ungulates have varied responses to human activity. In Alberta, moose numbers were negatively associated with cross-country ski trails, although elk numbers were unaffected (Ferguson and Keith 1982). Other studies found that large animals were displaced from trails or roads, but that there was a negligible effect on distributions and movements (Chester 1976; Aune 1981 in Boyle and Samson 1985; Schultz and Bailey 1978; Cole 1983). Animals would probably avoid roads and trails (at least when humans were present). With increasing but similar patterns of use concentrated along roads and trails and the availability of areas of cover and forage, human disturbance would probably have a negligible effect on ungulate distribution and movements. However, if prey species were displaced to less produc-

tive areas or to portions of their winter range outside the park (where they would be hunted), this would reduce prey availability for wolves. The severity of this reduction would depend on habitat conditions and prey population status and trends.

Wolves and prey species, even if not displaced from habitat, would be subject to additional human-induced stress during an already vulnerable time in the winter. Animals remaining in the area would expend more energy avoiding intrusion, and this could affect survival and reproduction. Potential consequences would probably be aggravated by natural effects such as severe winters.

The extent of potential impacts on wolves and prey species could be reduced through monitoring visitor use and wildlife populations and implementing visitor use restrictions as necessary. These could include restrictions on off-trail travel, specific area closures, or party size limitations, as well as visitor education and law enforcement. With these precautions it is not anticipated that wolves would be discouraged from using or establishing territories in the Many Glacier and St. Mary areas.

Divide Creek Flood Hazard — Removing facilities from the Divide Creek floodplain and restoration of the area would provide additional wintering habitat for prey species, which could have a beneficial effect on wolves. Relocation of the Divide Creek facilities could impact wolves, depending on their location. Further analysis would be conducted as part of the site-selection process.

West Side Discovery Center and Museum — Construction of the west side discovery center and museum north of the T-intersection would probably not have an adverse affect on wolves unless wolf use in the McDonald Valley increased. Wolves could be indirectly adversely affected if prey species or their habitat were lost in this area. The extent would be dependent on the specific location of the facilities. Placing these facilities close to existing development would ensure that impacts would be negligible.

Grizzly Bears.

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. If additional pullouts were recommended, the following effects could occur. Increasing visitor use resulting in more pullouts, picnic areas, and trails along the Going-to-the-Sun Road could adversely affect grizzly bears. Impacts could include increased habituation through human contact and food attractants or displacement, which would result in an effective decrease in usable habitat. Increased habituation could lead to increased human/bear contacts and conflicts that could ultimately result in the removal or death of bears. Additionally, greater development in the road corridor could create a barrier to grizzly movement. Bears could alter their use of areas near roads from daylight to night, allowing some continued use of habitat near roads and crossing opportunities. Further analysis and studies would be completed to determine the specific locations, numbers, and sizes of

new developments based on minimizing impacts on bears and avoiding known grizzly bear crossing corridors.

Transportation system parking could indirectly affect bears if visitors used parking and bus pickup areas in the early morning or evening when bears are most active. This could result in increased encounters between people and bears. Studies on bear road crossings would be used to site the parking areas. Parking at Logan maintenance pit would result in the loss of suitable summer habitat. Bears would be displaced from this area or possibly would become habituated to visitor use. Parking at Sun Point would probably not affect bears because the area is already developed. Increasing visitor use could have an effect on bears through increased bear/human encounters. Limiting visitor use could benefit bears by decreasing bear/human encounters.

Preservation of the Going-to-the-Sun Road — Reconstruction of the Going-to-the-Sun Road would temporarily displace bears from areas under construction. Reconstruction over a shorter timeframe than in the no-action alternative would benefit bears by reducing the overall length of construction disturbance along the road. Grizzly bears in less frequented areas of the park could be adversely affected if visitors were displaced from the Going-to-the-Sun Road corridor and began to use other areas such as Many Glacier, Two Medicine, the North Fork, and Cut Bank in greater numbers.

Preservation of the Historic Hotels and Visitor Services — Rehabilitation of the Many Glacier Hotel and Swiftcurrent Motor Inn during the summer would probably not affect grizzly bears because the Many Glacier Valley is heavily used by summer visitors. Adverse effects would be more likely during the spring and fall, since bears are accustomed to decreased visitor use during these periods, and the bears are either coming out of or preparing to go into hibernation. Rehabilitation of other areas of the park would temporarily affect bears during the construction period.

Scenic Air Tours and Personal Watercraft — Banning scenic air tours (especially helicopters) and personal watercraft would benefit bears by decreasing the potential for human disturbance.

Winter Use — Increased winter use in the park would not be likely to adversely affect bears because they hibernate between December and March, although there is evidence that a few bears are active in this period. Grizzly bears might be affected if human use of the park increased, during stressful, critical periods in fall (before December) when they are preparing for hibernation or in spring (after March) when they are searching for food after emerging from their dens. Increased visitor use during these periods, which would be enhanced by road plowing, could result in more encounters or attractants, which could adversely affect bear behavior (displacement or habituation) or reproductive success. Increased encounters could also result in the removal or death of bears.

Bears in the North Fork area are active throughout the winter. Increased visitor use there would be likely to affect them adversely by increasing encounters during a stressful period of the year.

Divide Creek Flood Hazard — Removing facilities from the Divide Creek floodplain and reclaiming the area would provide additional bear habitat. Beneficial effects would extend beyond the boundaries of the reclaimed area because employee use of the surrounding area would decline. Relocation sites for the Divide Creek facilities could impact grizzly bears, depending on their location. Further analysis would be conducted as part of the site selection process.

West Side Discovery Center and Museum — Constructing the west side discovery center and museum north of the T-intersection would result in a minimal loss of habitat. Grizzly bears and other wildlife travel to and from the Apgar Mountains and Belton Hills through a valley corridor between Apgar and West Glacier. This is the primary travel corridor available because of development in and outside of the park.

Peregrine Falcons.

Banning scenic air tours, especially helicopter flights, would benefit peregrine falcons. According to Glacier National Park biologists, there have been documented migrations through the park. Although no nests have been documented in the park, there are active nests in the general area, and future nesting is anticipated due to increasing populations. Banning scenic air tours might improve high-elevation habitat for potential falcon nesting. There would be no effect from other actions in this alternative.

Federally Proposed Species

Lynx.

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. If additional pullouts were recommended, it is not known how lynx would be affected by construction of facilities in areas or corridors of development and concentrated use. There is little documentation of lynx using roadside areas in summer. Limiting visitor use would have no effects on lynx.

Preservation of the Going-to-the-Sun Road — Lynx might be temporarily adversely affected by increased visitation in less-used areas of the park during the reconstruction of the Going-to-the-Sun Road. If reconstruction was done in winter, mitigation would be required to minimize adverse effects.

Preservation of Historic Hotels and Visitor Services — Lynx would probably not be affected by construction of facilities in areas or corridors of development and concentrated use; there is little documentation of lynx using such areas.

Scenic Air Tours — Lynx could benefit from a ban on scenic air tours because the potential for human disturbance would be decreased. Lack of information about lynx numbers and distribution precludes a more thorough assessment.

Personal Watercraft — Lynx might benefit from a ban on personal watercraft on Lake McDonald, Lake Sherburne, and St. Mary Lake, though benefits might be negligible.

Winter Use — Based on very limited information on lynx use in the park, they could be adversely affected if winter use increased appreciably in areas like the Lake McDonald Valley, the east side of the park, and other suitable coniferous forest habitats. Most lynx sightings in winter have been along park roads.

Divide Creek Flood Hazard — Removing facilities from the Divide Creek flood hazard zone and reclaiming the area could provide additional suitable habitat for lynx. Relocation sites for the Divide Creek facilities could impact lynx depending on their location. Further analysis would be conducted as part of the site selection process.

West Side Discovery Center and Museum — Construction of the west side discovery center and museum north of the T-intersection could remove suitable lynx habitat. By placing these facilities close to existing development, there would be negligible effects.

State-Listed Rare Species

Common Loon.

Loons would benefit from a ban on personal watercraft on Lake McDonald, Lake Sherburne, and St. Mary Lake. Loons would also benefit from a ban on scenic air tours because the potential for human disturbance would decrease. Construction of pullouts, trails, or picnic areas along lakeshores could affect loons, depending on location. Further analysis would be conducted as part of the site selection process to mitigate impacts on nesting areas.

Harlequin Duck.

Harlequin ducks could be adversely affected by construction of pullouts, trails, or picnic areas along McDonald Creek depending on location. Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. The use of the Logan maintenance pit for transportation system parking could affect harlequin ducks because it is a breeding area, and runoff from the parking area could negatively affect water quality. Parking lot design would include mitigation of water quality degradation. Limiting visitor use would benefit harlequin ducks by decreasing disturbance in their habitat.

Osprey.

Osprey would benefit from a ban on personal watercraft on Lake McDonald, Lake Sherburne and St. Mary Lake. Osprey would also benefit from a ban on scenic air tours because the potential for human disturbance would decrease.

Northern Goshawk, Cooper's Hawk, Golden Eagle, Merlin, and Prairie Falcon.

These birds would not be adversely affected by the preferred alternative. They would benefit from a ban on scenic air tours because disturbance would decrease.

Trumpeter Swan, Northern Pygmy Owl, Barred Owl, Great Gray Owl, Long-Eared Owl, Boreal Owl, Northern Saw-Whet Owl, Northern Hawk-Owl, Pileated Woodpecker, Olive-Sided Flycatcher, Western Bluebird, LeConte's Sparrow, Clay-Colored Sparrow, Brewer's Sparrow, and Gyrfalcon.

There is not a great deal of information available about these species, so it is not possible to predict the full effects of the actions. All of the species could be affected to a limited degree by loss of habitat from construction and disturbance from increased visitor use if additional pullouts were constructed. Placing limits on visitor use would benefit these species by decreasing disturbance in their habitat. They also could benefit from a ban on scenic air tours because human disturbance could be decreased. Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road.

Northern Bog Lemming.

Northern bog lemming would probably not be adversely affected by any of the preferred alternatives. Impacts are not expected to occur in lemming habitat.

Marten, Fisher, and Wolverine.

Development and visitor use would continue to reduce the habitat suitability for these species. Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. Increasing winter use by visitors could further disturb these species, although even the current, generally low levels of visitor use may have already resulted in some displacement. This probably would be most likely for wolverines, which are very sensitive to human presence. If increasing winter use extended into higher elevations, wolverines could be affected by disturbance at late winter den sites; animals could abandon dens when disturbed during this sensitive period.

Conclusion. Bald eagles could be negatively impacted by increasing levels of human use near Lake McDonald, St. Mary Lake, and other lakes where they nest. Some of these impacts could be mitigated by temporary area closures around nest sites. Monitoring would continue and additional mitigation would be designed and implemented if necessary to protect the species. As use increased during winter months, wolves and their prey could be displaced in the Many Glacier and St. Mary Valleys and in the lower portion of the Lake McDonald Valley. Grizzly bears could be negatively impacted by increasing levels of visitor use, by visitor center construction, and by reconstruction along the Going-to-the-Sun Road. Impacts would include habituation of some bears, disruption of travel patterns, and displacement. Many other species would be affected to some degree by increased

visitor use in the Going-to-the-Sun Road corridor and by increased winter use. Grizzly bears, wolves, eagles, loons, osprey, and other species would benefit from the reduced human disturbance resulting from bans on personal watercraft and scenic air tours and from limits on visitor use, if implemented.

In accordance with section 7 of the Endangered Species Act, the National Park Service has determined that the preferred alternatives for visitor use on the Going-to-the-Sun Road, preservation of the Going-to-the-Sun Road, preservation of historic hotels and visitor services, winter use and the Divide Creek flood hazard probably would not likely adversely affect any federally listed species and that the preferred alternatives for scenic air tours and personal watercraft would have no effect on federally listed species. This determination was reached because most of the reconstruction would take place in already developed areas inside the park. Additional plans would be developed in more detail and submitted to the U.S. Fish and Wildlife Service for that agency's review, and additional mitigation would be identified in consultation with the U.S. Fish and Wildlife Service. The *Draft Environmental Impact Statement* was submitted to the U.S. Fish and Wildlife Service for concurrence with the determinations of the National Park Service.

Cumulative Impacts. The *Grizzly Bear Recovery Plan* for the Northern Continental Divide Grizzly Bear Ecosystem Management Area, as developed by the U.S. Fish and Wildlife Service and the Interagency Grizzly Bear Committee (in which the park staff participates), outlines the park's responsibility for actions that are necessary for the conservation and recovery of the grizzly bear. Implementation of this plan would result in cumulative benefits for the recovery of the grizzly bear.

The actions called for in the *Montana Bald Eagle Management Plan*, completed by state and federal agencies and some private landowners, would result in positive cumulative impacts on the recovery of the bald eagle in the ecosystem. The management goal for Montana is to provide secure habitat for bald eagles and to maintain a viable, healthy, and self-sustaining population as close to peak level as possible. However, productivity (the number of young produced and fledged) of eagle nests in the park is poor and below the level established for recovery of the species. The low productivity is attributed to a relatively short nesting season, decline in native fish populations, and recreational facility development and associated use in the nesting territories.

The implementation of actions called for in the *Northern Rocky Mountain Wolf Recovery Plan* would result in positive cumulative impacts for the recovery of the gray wolf. A viable prey base in the park and secure denning areas are particularly important. Disruption of prey, particularly on winter range, coupled with continued development outside the park and problems with landowners, could have adverse cumulative effects.

Management actions as proposed in the preferred alternative and actions outside the boundary such as coal mining and logging in British Columbia and on national forest land in the U.S., increasing private development in the North and Middle Fork Valleys and in the corridor between West Glacier and Columbia Falls, increasing train traffic and trains carrying hazardous materials, and recent gas and

oil leases and private development on the Blackfoot Indian Reservation could cumulatively affect wildlife populations and habitat. Because the park is not large enough to support sustainable populations of all these species, the impacts could be cumulative and adverse. Cumulative impacts on fall, winter, and spring habitat and use could be greater in this alternative than in the no-action alternative. Monitoring of all these species would continue, and mitigation would be developed if necessary to reduce cumulative adverse impacts.

Impacts on Wildlife Other than Listed Species

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. Depending on the recommendations, the following effects could occur. Increased use of the Going-to-the-Sun Road and the new pullouts, trails, and picnic areas along the road would result in further loss of habitat and disturbance of various wildlife species that live or travel close to the road. Ungulates would probably be displaced from areas adjacent to the road, but their distribution would probably not be affected. There would be minor displacement of ungulates along roadsides. Habituated ungulates might have to be trapped and relocated from some roadside areas. Limiting visitor use might benefit wildlife by decreasing encounters and disturbance of habitats.

Preservation of the Going-to-the-Sun Road — Reconstruction of the Going-to-the-Sun Road would temporarily adversely affect wildlife species that live or travel near or cross the road. Wildlife would be temporarily displaced during construction. No long-term negative effects are expected. Wildlife could be temporarily adversely affected by potential increased visitation in other areas of the park during reconstruction.

Preservation of Historic Hotels and Visitor Services — Rehabilitation of visitor facilities in the park would have temporary adverse effects on wildlife during construction, temporarily displacing wildlife from these areas or causing increased habituation. Construction during the summer would be less likely to adversely affect wildlife. Adverse effects would be more likely during the spring and fall because wildlife are accustomed to decreased visitor use during these periods, and many are more vulnerable to disturbance. For example, bighorn sheep migrate through the valley during spring and fall, using the same routes to reach seasonal range each year. Bighorns have difficulty locating alternate routes, so if these routes were restricted or closed, use of traditional ranges would be reduced or eliminated. Some seasonal and time-of-day limitations on construction could be implemented.

Scenic Air Tours — Banning scenic air tours could benefit wildlife by reducing the potential for disturbance.

Personal Watercraft — Wildlife, particularly waterfowl, shorebirds, and other animals that use shorelines would benefit from banning personal watercraft because the ban would reduce disturbance.

Winter Use — Increased winter use in the lower elevations of the park would adversely affect wildlife that are active in the winter, displacing them from areas near roads, ski trails, and developed areas. It could also result in habituation and could lead to more conflicts with habituated wildlife such as white-tailed deer, bighorn sheep, or mountain lions. Consistent plowing of access roads could increase illegal hunting in the park. Wildlife would be subject to additional human-induced stress during an already vulnerable time in the winter. Animals remaining in the area expend more energy avoiding intrusion, and this can affect survival and reproduction. Potential effects would probably be compounded by natural stresses such as severe winters. This alternative would have a greater potential to impact wildlife than the no-action alternative because human activity would increase during winter when many animals are vulnerable to disturbance. The extent of impacts on wildlife could be reduced through monitoring of visitor use and wildlife populations. Restrictions on off-trail travel, closures of specific areas, and limitation of party sizes, as well as visitor education and law enforcement, would also reduce impacts.

Divide Creek Flood Hazard — Removing facilities from the Divide Creek flood hazard area and reclamation of the area would provide additional habitat for wildlife species that are currently excluded or have limited use of the area. Impacts on wildlife would depend on the sites chosen for relocation. Further analysis would be completed as part of the site selection process.

West Side Discovery Center and Museum — Construction of the west side discovery center and museum north of the T-intersection would result in the loss of wildlife habitat. The extent of the loss would be dependent on the specific location of the facility. The general area is used as an elk calving ground, and it is a foraging area or travel corridor for many other species such as mule deer, white-tailed deer, black bears, and mountain lions. By placing these facilities close to existing development, the impacts would be negligible.

Conclusion. Construction associated with expanding day use opportunities, visitor center construction, and road rehabilitation would result in the temporary disturbance and displacement of many species and a small amount of habitat loss for some species. Increasing winter use could cause displacement and stress to such animals as deer, elk, and mountain lions that concentrate in lower elevation valleys during the winter. Many species, especially those using lake and lakeshore areas or that summer in high elevations, would benefit from the reduced human disturbance resulting from the banning of personal watercraft and scenic air tours.

Cumulative Impacts. Management actions as proposed in the preferred alternative and actions outside the boundary such as timber harvest activities on Forest Service lands, coal mining in British Columbia, increasing private development in the North and Middle Fork Valleys and in the corridor between West Glacier and Columbia Falls, increased train traffic carrying hazardous materials, and gas and oil leases and private development on the Blackfoot Indian Reservation, could cumulatively affect wildlife populations and habitat. Because the park is not large enough to support sustainable populations of all these species, the impacts could be cumulative and adverse. Cumulative impacts on fall, winter, and spring habitat could be greater in this alternative than in the no-action alternative.

Impacts on Air Quality

Management Zoning. The management strategy would not adversely affect air quality throughout the park because 95% of the park would be managed as a national area and no actions would occur that would permanently decrease air quality.

Visitor Use on the Going-to-the-Sun Road — According to the *Transportation Plan* (NPS 1990d), traffic forecasting was done for the Going-to-the-Sun Road. “Based on data, trends, and forecasts reviewed to date, traffic forecasts for various segments of the Going-to-the-Sun Road have been developed. . . . Based on these forecasts, high use period average daily traffic (ADT) is projected to reach 6,080 per day by year 2007 from the west entrance to Camas Road. Peak day volumes may be between 7,200 to 7,800 vehicles per day” (p. 26 of the *Final Transportation Plan*). However, auto emissions are not good for the park’s air quality, but over the last 20 years emissions from vehicles have improved due to EPA standards and requirements. If auto use increases in the park, and emissions continue to decrease, the net result would be a “no net gain” in auto pollutants to the environment. Present monitoring does not indicate an increase in nitrous oxide. Although the amount of carbon monoxide emitted would continue to increase as visitation increased, this would not affect the state’s ability to maintain conformity with the required air quality standards. The effects on air quality from the projected increase in visitor traffic after the major rehabilitation of the Going-to-the-Sun Road were analyzed. Emissions estimates for nitrogen oxides (NO_x) and carbon monoxides (CO) from vehicles were calculated for four different scenarios to demonstrate that the projected increase in traffic would not have a significant effect on air quality in the park.

The emissions of NO_x and CO for the different traffic volume scenarios were calculated with the Environmental Protection Agency’s MOBILE-5b emissions model. Daily emissions were calculated for three different years: 1989, 1998, and 2007. The average daily traffic volumes for the different years are as follows: 1989, 5,040 vehicles; 1998, 5,500 vehicles, and 2007, 6,080 vehicles. Emissions from a projected peak daily traffic of 7,800 vehicles in 2007 were also calculated. It was assumed that traffic on the lower elevation parts of the road traveled at 40 miles per hour (mph) for 31 miles and that traffic on the upper parts of the road traveled at 25 mph for 21 miles. The mix of the different types of vehicles using the Going-to-the-Sun Road was supplied from traffic surveys conducted for the park in 1992.

It was assumed that 74.2 percent of the vehicles were automobiles; 7.9 percent, vans; 7.8 percent, light duty gas trucks; and 4.4 percent, heavy-duty gas RVs, It also was assumed that 0.9 percent were heavy-duty diesel buses and 4.4 percent were motorcycles. The emission calculations are considered “worst case” because it was assumed that no vehicle was in an emissions testing program; thus, the anti-tampering and inspection/maintenance (I/M) options in the model were not engaged. The reformulated gas option was not employed, because the fuel for the vehicles was assumed to have been purchased locally.

The analysis indicates that despite the increased volume in traffic, for an average day, the emissions would decrease in the future years. This is due to the increased emission control devices on vehicles, which reduce total emissions despite the increased traffic, as shown in table 5.

Additional analysis would be completed as part of the comprehensive use plan for the Going-to-the-Sun Road.

TABLE 5: EMISSIONS CALCULATIONS

Year	Vehicles per Day	No _x Tons per Day	CO — Tons per Day
1989	5,040	0.64	9.58
1998	5,500	0.58	5.64
2007	6,080	0.56	2.61
2007	7,800	0.71	3.35

Preservation of the Going-to-the-Sun Road — Road construction would be done in accordance with guidelines and regulations to ensure continued maintenance of national air quality standards for motor vehicle-related pollutants such as ozone and carbon monoxide. Operation of a batch plant in or near the park during repaving would contribute to the increase in particulate matter on the west side of the park. Consultation and approval by the state would be required prior to placement and operation of a batch plant.

Preservation of Historic Hotels and Visitor Services — Air quality would not be adversely affected by rehabilitation or new construction associated with the historic hotels and visitor services inside the park. Air quality could be temporarily adversely affected during construction, but this would be of a short duration and would not have permanent effects.

Scenic Air Tours — Banning scenic air tours parkwide would have a positive effect on air quality in the park.

Personal Watercraft — Banning personal watercraft throughout the park would help to protect air quality in localized areas.

Winter Use — Under certain atmospheric conditions air quality might decrease as the result of a buildup of ozone and particulate matter, but overall there would be no significant impact.

Divide Creek Flood Hazard — Relocation of the development in the Divide Creek floodplain would not adversely affect air quality. There could be temporary adverse effects while the development was being removed from the area.

West Side Discovery Center and Museum — Construction of a new west side discovery center and museum would have temporary adverse effects on air quality during construction due to the operation of construction equipment and movement of soils. This would be of a short duration and would not have long-term adverse effects on air quality.

Conclusion. The increased traffic due to the major rehabilitation of the Going-to-the-Sun Road would not have a significant effect on air quality in the park and would preserve the park's attainment status of the National Ambient Air Quality Standards for NO₂ and CO and the Prevention of Significant Deterioration class I increment for NO₂. Overall the effects on air quality would be minor. No state or federal air quality standards would be expected to be exceeded. There might be temporary adverse impacts during construction because of dust, but they would not be significant.

Cumulative Impacts. Increases in park visitation combined with projected increases in the population on the west side of the park could cumulatively affect air quality in the region by increasing total vehicle emissions regionally.

Impacts on Natural Sounds

Management Strategy. The management strategy would have an indirect beneficial impact on natural sounds because over 95 percent of the park would be managed as a wild area and actions taken within that area would not interfere with the ability to hear natural sounds. The developed areas would not be expanded beyond the visitor service zones. Within these areas, noise levels may at times interfere with the ability to hear natural sounds due to the high numbers of visitors and vehicle traffic.

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. The following effects could occur. Modification of existing and construction of additional pullouts would temporarily increase noise levels in the park, reducing the natural quiet in the park. Limiting visitor use would decrease noise in the park.

Preservation of the Going-to-the-Sun Road — Noise levels would temporarily increase in the park along the road corridor and adversely affect natural sounds.

Preservation of Historic Hotels and Visitor Services — Rehabilitation of the historic hotels and potential new development would increase noise levels in the park from construction activity. This would be of a short duration, would take place over a number of years, and would not result in permanent adverse impacts on natural sounds and the ability to hear them.

Scenic Air Tours — This action would have a positive effect on natural sounds in Glacier National Park, removing a source of noise that is now common during the summer, spring, and fall due to engine and rotor noise. Natural sounds would indirectly be adversely affected by increased air tour activity outside the park and might be directly affected over adjacent areas such as the Bob Marshall Wilderness complex and the Blackfeet Indian Reservation.

Personal Watercraft — Permanently banning personal watercraft would protect natural sounds.

Winter Use — Natural sounds could be adversely affected, but due to the nature of the activities and locations of the use, the effects of increased noise would be negligible.

Divide Creek Flood Hazard — Removing facilities from the Divide Creek floodplain would increase noise levels and affect natural sounds temporarily. Restoration of the area would restore natural sounds that are no longer heard. Relocation of the facilities and their effects on natural sounds in the new areas would have to be assessed after locations were selected.

West Side Discovery Center and Museum — Development of a west side discovery center and museum would temporarily affect natural sounds during construction. Operation of the facility and resulting visitor use in the area would increase noise levels in an area that is now undeveloped.

Conclusion. Noise levels would increase in the park during reconstruction of the Going-to-the-Sun Road, rehabilitation of the historic hotels, and construction of new developments. Noise levels would also increase while the development near Divide Creek was removed. However, all of these activities would be of a short duration and would not permanently adversely affect natural sounds in the park. Banning scenic air tours and personal watercraft would have a significant positive effect on natural sounds in the park.

Cumulative Impacts. Natural sounds would be indirectly adversely affected by increased air tour activity outside the park as the result of the banning of scenic flights over the park. There would be no other cumulative impacts.

Impacts on Biological Diversity

Management Strategy. The management strategy would have an indirect beneficial impact on biological diversity because over 95 percent of the park would be managed as a wild area, and the major developed areas would not be expanded beyond the visitor service zones.

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. If additional pullouts were recommended, the following effects could occur. The modification of existing or development of additional pullouts, picnic areas, parking, and trailheads along the Going-to-the-Sun Road might not adversely affect biodiversity by contributing to additional habitat fragmentation. The vegetation disturbance or removal that often accompanies construction could also provide optimal conditions for exotic species to grow and spread if not contained by aggressive management actions. The presence of exotic species reduces biodiversity in plant communities.

Biological diversity could also be reduced if new roadside facilities result in damage to or removal of portions of sparsely distributed plant communities such as the mature cedar-hemlock forests in the McDonald Valley.

The development of additional pullouts, picnic areas, and trailheads along the Going-to-the-Sun Road has the potential to disturb feeding, nesting, or roosting bald eagles and to reduce the chances for reproductive success. Similarly the development of new trails along the Going-to-the-Sun Road has the potential to displace grizzly bears and to increase human-bear encounters. These actions could adversely affect biodiversity in the long run. Wildlife travel corridors could be dis-

rupted and the use of feeding areas could be precluded. Limiting visitor use could benefit biodiversity by limiting habitat disturbance and reducing the number of encounters.

Preservation of the Going-to-the-Sun Road — Reconstruction activities could have a minor impact on biodiversity by displacing wildlife from the reconstruction areas and by obstructing wildlife movement and migration. This could be especially true for grizzly bears that use high elevation habitat along the road during the time when reconstruction would occur. Diversity of roadside plant communities could also be slightly impacted because ground disturbance provides optimal growing conditions for exotic plants. Impacts on plant biodiversity would be partially mitigated by aggressive management actions, including prompt revegetation with native species and the use of selective herbicides.

Preservation of Historic Hotels and Visitor Services — Plant community diversity should not be impacted by preservation activities associated with the maintenance of the hotels and lodges. The construction of new lodging facilities could indirectly impact plant community diversity by removing vegetation during construction and by trampling resulting from increasing numbers of people using areas adjacent to these facilities.

Scenic Air Tours — The cessation of scenic air tours would have no impact on vegetation community biodiversity in or near the park. Such cessation could have a positive impact on populations of certain animals, especially ungulates (such as elk) and carnivores (such as grizzly bears) that feed at high elevations during the summer, and nesting raptors. Another positive benefit would be that the movement patterns of eagles, ducks, and other species that move in and out of the park along the Middle Fork of the Flathead River would not be interrupted by low-flying aircraft.

Personal Watercraft — The permanent ban on PWC use in the park would benefit park biodiversity by eliminating a potential source of wildlife harassment and a form of recreation that could be destructive to aquatic ecosystems (see description of PWC impacts under no action).

Winter Use — Increased and more dispersed winter use would have little impact on the diversity of plants or plant communities in the park because of the protection snow provides and because plants are dormant during winter. The proposed changes could result in long-term impacts on animal biodiversity. Expansion of plowing during the winter in some of the lower valleys could affect species that concentrate where there is less snow and where food is more likely to be found. This is especially true for ungulates such as elk and deer and their predators, such as wolves and cougars. The increased human presence that would result from the additional plowing could result in temporary displacement of the animals from their winter ranges and additional energy consumption at a time when the animals are already under climatic stress and when food is limited. For threatened and endangered species such as the wolf and for species of concern such as the wolverine and lynx (numbers of which are already very low) the additional stress caused by increased human presence during the winter could cause a decrease in population.

Divide Creek Flood Hazard — Implementation of this alternative could result in long-term improvements to the health of the aquatic ecosystems of Divide Creek and its associated wetlands and to the biodiversity in the area.

There could be impacts on biological diversity from the construction of new facilities to replace those removed from the Divide Creek floodplain. Impacts would depend on their location and the magnitude of disturbance. These impacts would be evaluated later.

West Side Discovery Center and Museum — There would be negligible impacts on biodiversity because this area is already surrounded by development.

Conclusion. It is unlikely that any plant or animal species would be eliminated as a result of implementing any of the preferred alternatives. There would, however, be some impact on individual species and to biological communities in the park if the preferred alternatives were implemented. Some of these impacts could weaken biological diversity by damaging community integrity or by preventing species numbers from naturally expanding.

Cumulative Impacts. Biodiversity would probably be impacted both positively and negatively in a cumulative sense if all seven of the preferred alternative actions were implemented.

A number of the preferred alternatives have the potential for displacing wildlife. These include increased winter use and fast-track road reconstruction. A possible cumulative impact to biological diversity would be displacement and habitat fragmentation in important wildlife habitat on the west and south sides of the park as the result of residential and commercial development. These impacts would probably be most severe during the winter.

Biological diversity in a regional context could be positively impacted by banning scenic air tours over the park. This ban, if combined with a lessening of such flights externally, could enhance wildlife movements between the park and adjacent land and lessen the impacts on all species that feed at higher elevations or that use the Middle Fork of the Flathead River as a migratory corridor. Conversely, if air tour activity increased over adjacent land after the park ban is implemented, wildlife movement and feeding activity outside the park could be negatively impacted.

IMPACTS ON THE CULTURAL ENVIRONMENT

Impacts on Cultural Resources

Management Strategy. The management strategy would have an indirect beneficial impact on cultural resources by providing a tool to manage and provide for a quality visitor experience while protecting resources. All actions taken within the zones would protect and preserve cultural resources in the park.

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. Depending on the recommendations, the following effects could occur. The 15 features along the Going-to-the-Sun Road that have been identified as defining its

historic character could be adversely affected by the development or modification of the road. These features are the road, the Sprague Creek culvert, the Snyder Creek culvert, the horse trail underpass (west), the Avalanche Creek bridge, the Logan Creek bridge, the west side tunnel, the Granite Creek culvert, the Haystack Creek culvert, Triple Arches, the east side tunnel, the Siyeh Creek culvert, the Baring Creek bridge, the St. Mary River bridge, and the Divide Creek bridge. Cultural resource values would be directly impacted by modifying existing and constructing new pullouts and visitor use areas along Going-to-the-Sun Road and by the expanded transportation system, but those effects could be mitigated through good design. A pullout at Sunrift Gorge might allow the national register site nearby to be interpreted. Indirectly, these facilities would increase the visitor parking capacity, which would increase wear and maintenance needs.

A patrol cabin near Sunrift Gorge has been listed on the National Register of Historic Places. Development in the area would increase the danger of vandalism.

Careful review during design would allow avoidance of all known archeological resources near parking lots, trails, the discovery center and museum, and road reconstruction areas. Visitor use would have no effect on cultural resources because it is not the cause of the deterioration of these features.

Preservation of the Going-to-the-Sun Road — This alternative would preserve the cultural resources and significance of the Going-to-the-Sun Road because the reconstruction work would be done before major failure could occur.

Preservation of Historic Hotels and Visitor Services — Direct impacts would include an improvement in the condition of the historic structures used for visitor services. Continued use would be a positive impact. Some remodeling and adaptive use would be necessary to continue to maintain the buildings in desirable condition for use as visitor facilities, and impact on historic values would not necessarily be adverse. Newer structures added to historic groupings would not be adverse if the new structures were designed and placed sensitively. Indirect impacts on park historic values would include the continuance of visitors' options to enjoy the park's historic facilities in a traditional manner. Use of the facilities could increase, which would necessitate an increased maintenance schedule. If a deteriorated structure was removed or replaced, this would constitute an adverse effect. The National Park Service would consult with the state historic preservation officer, as required by section 106 of the National Historic Preservation Act.

Scenic Air Tours — There would be no effects on cultural resources, including archeological resources, because there would be no ground-disturbing activities.

Personal Watercraft — This action would have no known direct effect on cultural resources. Indirectly, park visitors would be able to enjoy historic activities (launch tours, fishing, scenic viewing) and historic settings such as Lake McDonald Lodge without the intrusion of noise from personal watercraft.

Winter Use — There would be no effects on cultural resources, including archeological resources, because there would be no ground-disturbing activities. More activity in the area might mean that some resources such as Lake McDonald

Lodge would be subject to vandalism; however, more activity could serve to deter acts of vandalism.

Divide Creek Flood Hazard — Removal and relocation would adversely affect all historic resources in the St. Mary maintenance area historic district. Removal of the maintenance area would negatively impact the historic structures. Mitigation would be conducted, including Historic American Building Survey documentation. Removal of the administrative and maintenance facilities and employee housing in the Divide Creek floodplain in St. Mary would have no effect on archeological resources. The new location for these facilities would require extensive archeological investigation and mitigation to avoid the loss of unknown archeological resources. This work would be completed before construction in accordance with cultural resource laws and policies. The possibility of disturbing archeological resources that were not discovered during preconstruction investigation would continue. Monitoring would be required during construction.

West Side Discovery Center and Museum — A new discovery center and museum near the T-intersection would have no adverse effect on known archeological resources. The area near the T-intersection has been surveyed for archeological resources, and none were found. Consultation with American Indian tribes would help to avoid impacts on resources they may deem culturally significant at this location. A new discovery center and museum could benefit archeological resources indirectly through interpretation. The associated museum would be of great benefit to preservation and any future expansion of the museum collection.

Conclusion. All actions would have positive effects on cultural resources with the exception of removal of the St. Mary maintenance area historic district, which would result in an adverse effect and would require mitigation and further consultation with the state historic preservation officer and the advisory council.

Cumulative Impacts. Actions taken in the park to preserve historic resources combined with actions taken by other land managing agencies and the state would result in a positive effect on preservation of historic resources throughout the surrounding region.

Impacts on the Blackfeet and Salish and Kootenai Tribes

Regular consultation with the Blackfeet Tribal Business Council and the Flathead Cultural Protection Office would ensure that the tribes would not be adversely affected by any of the alternatives.

IMPACTS ON THE SOCIOECONOMIC ENVIRONMENT

Impacts on Regional and Local Communities

Management Strategy. The management strategy would have an indirect beneficial impact on regional and local communities by providing a tool to manage and provide for a quality visitor experience while protecting resources.

Local and regional economies would benefit from the federal funds spent on resource preservation and protection. This would result in direct, indirect, and cumulative positive impacts on the regional and local economies.

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. If additional pullouts were recommended, the following effects could occur. There could be positive economic benefits to the local and regional economies. Visitor expenditures and expenditures for rehabilitation and maintenance of the road would also continue. Expansion of opportunities along the Going-to-the-Sun Road would probably have a positive economic benefit. Improving the public transportation system would also be expected to have a positive economic benefit. Limiting visitor use might adversely affect the economic environment because it might limit the number of visitors to the area.

Preservation of the Going-to-the-Sun Road — A loss in visitor spending throughout the state would result during construction, but there would be a contribution to the local and regional economies associated with the construction spending.

According to a study conducted by Bioeconomics, Inc., in 1997, it is estimated that park visitation would be reduced by 12-20 percent each year throughout the reconstruction period, which would be a reduction of 1.5-1.8 million visitors distributed over the construction period. The 12 percent average reduction in use under this alternative is well within the 9 percent positive to 19 percent negative range in fluctuation of Glacier's visitation due to other factors such as weather, fees, and previous road reconstruction projects over the past 10 years. The higher range is slightly more than the largest annual decrease in park visitation in the last 10 years, which was 18 percent (recorded in 1985).

The Institute for Tourism and Recreation Research at the University of Montana School of Forestry conducted an analysis in June 1998 in which it was concluded that the reconstruction actions would result in a substantial negative economic impact from to loss of tourism. It is estimated that the direct tourism dollar loss to the state would be \$81-\$84 million, with total losses of \$129-\$135 million. When anticipated economic gains due to construction expenditures are accounted for, the expected net direct loss to the state would be \$99-\$105 million. The report also estimated direct tourism losses in the Glacier area (including Waterton, Alberta) of \$63-\$65 million. The estimated losses for specific industries are as follows:

Lodging	\$15-\$16 million
Retail	\$20-\$21 million
Restaurants and bars	\$14 million
Gasoline and oil	\$16-\$17 million
All others	\$15-\$16 million

It should be noted that these estimated losses would be for the entire reconstruction period. If considered on an annual basis, the loss would be approximate-

ly one-tenth of the above totals depending on the length of time required to complete the reconstruction and assuming equal increments of construction annually.

Based on *Estimated Economic Impacts of the Going-to-the-Sun Road Closure and Reconstruction* (Duffield 1997) there would be negative and positive impacts on the economy of the state of Montana. There would be reductions in visitor expenditures to varying degrees for each of the years that the Going-to-the-Sun Road was under construction. This could be offset by support services (housing, food) required by the construction labor force. Visitor expenditures and personal income in the state would be reduced. Montana contractors would have the opportunity to compete for approximately \$70 million-\$100 million in road reconstruction contracts.

It is expected that the anticipated 12 percent reduction in annual visitation to Glacier National Park would have a disproportionately negative effect on businesses in the gateway communities.

By spreading the construction out over a longer period of time, less money would be invested during any particular year. Consequently, events such as unusually heavy snow, floods, and particularly rainy summers would have less of an effect on the overall reconstruction program. New economic data would be forthcoming from additional economic studies of the reconstruction of the Going-to-the-Sun Road.

Preservation of Historic Hotels and Visitor Services — Preservation activities would be an economic benefit to the regional economy. An analysis by Bioeconomics using cost figures of \$50-\$80 million made the following assumptions in order to estimate the extent of the impact. First, funding would come from outside the local area. Second, reconstruction would be spread over a five- or ten-year period. And third, all construction contracts would be won by Montana-based businesses. The regional economic impact on personal income has been estimated at \$3.4-\$5.4 million annually for a ten-year scenario and \$6.8-\$10.9 million annually for a five-year construction program. The total employment impact has been estimated at 137-219 full- and part-time jobs in the ten-year scenario and 273-437 full- and part-time jobs in the five-year scenario. The regional impact on total industrial output would be \$7.9-\$12.7 million for the ten-year construction period and \$15.9-\$25.4 million for the five-year scenario. In the short term, phasing of rehabilitation might require closure of all or part of the facilities during the summer. The concessioner would suffer loss of revenue during this period. Fewer employees would be hired by the concessioner, but more construction jobs would counter this loss. In the long term the concessioner would have improved facilities with lower maintenance expenses and the potential for lower operational costs and increased revenue.

Scenic Air Tours — According to Bioeconomics, Inc., air tours are not expected to completely disappear from the area, since operators would still be able to conduct air tours around the park and would have the option to develop tours in the adjacent Bob Marshall Wilderness complex.

Personal Watercraft — This action would have a negligible impact on expenditures due to the temporary ban on personal watercraft that has been in effect

since 1996. Although there are local businesses that cater to PWC users, a ban should not significantly affect them because there are many locations outside the park for the use of these watercraft.

Winter Use — Bioeconomics, Inc., concluded that if winter visitation levels increased, the surrounding communities could expect spending impacts from these additional visitors.

Divide Creek Flood Hazard — In 1992 it was estimated that this action would cost \$20-\$40 million. According to the analysis of Bioeconomics, Inc., this would benefit the regional economy by adding \$6.5-\$13 million annually, increasing total personal income \$3.3-\$6.5 million per year, and adding 130-260 jobs during a five-year construction period. If facilities were moved out of the St. Mary area there would be a small adverse effect on businesses in St. Mary because a source of income would be removed, particularly during the winter.

West Side Discovery Center and Museum — Construction of a west side discovery center and museum was estimated at \$1,091,000 in 1981. Today it would be expected to cost at least \$1,883,000. The model run by Bioeconomics, Inc., indicated a positive economic benefit to the region of \$3,058,000. Personal income would increase \$1,536,000, and employment would increase by 61 jobs during construction. These benefits are expected to be largely felt in the region rather than the state as a whole.

Conclusion. The overall beneficial contribution that Glacier National Park makes to the local and regional economies would continue in the long term. The rehabilitation of historic hotels and the Going-to-the-Sun Road would result in significant positive contributions to both the local and regional economies. There would be short-term adverse impacts on local businesses and the concessioner as a result of the rehabilitation of the historic hotels and the Going-to-the-Sun Road. Smaller expenditures for the west side discovery center and museum and the Divide Creek relocation would also benefit the region.

Cumulative Impacts. The preferred alternative would have a positive economic benefit on the local and regional economies and would add to an already robust economy.

Impacts on Local and National Visitors

Management Strategy. The management strategy would not adversely affect local and national visitors. It would benefit them by providing a very clear message about which areas are developed, which would accommodate higher levels of use, and which would accommodate lower levels of use.

Visitor Use of the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. Depending on the recommendations, the following effects could occur. The expanded and improved transportation system would enhance visitor use for those who would like to experience Glacier National Park and the Going-to-the-Sun Road through the use of a shuttle system. If the transportation system provided more parking opportunities along the road, visitors in private vehicles would have

an improved experience. Expanding opportunities along the corridor would enhance use, provide access to different resources, and improve appreciation for the park's various attractions. Limiting visitor use could benefit local and national visitors by improving their experience and ensuring access to park areas.

Preservation of the Going-to-the-Sun Road — Reconstruction would have a positive effect on local and national visitors in the long term. During the reconstruction period, all visitors would be temporarily adversely affected. After the reconstruction was completed, visitor safety would be improved.

This alternative would have the positive effect of getting the reconstruction work done in the shortest amount of time. Visitor use would be disrupted during the reconstruction effort. Delays in cross-park travel, one-way traffic, and other possible means of control necessary during reconstruction of the road would inconvenience visitors to Glacier during the project. The impact would be worse for national visitors than for local visitors because more detailed knowledge of construction activity would allow local visitors to adjust their travel patterns. This effect would be mitigated by increased information and communication with the visiting public outside the area. However, during the reconstruction, traffic probably would increase on other roads surrounding the park, such as Highways 2 and 49.

Preservation of Historic Hotels and Visitor Services — Rehabilitation would have a positive impact on visitors because it would ensure that a traditional overnight experience would continue to be available in the park. There would be a temporary adverse effect during the reconstruction, because it is likely that these facilities would be closed to visitors.

Scenic Air Tours — Banning scenic air tours parkwide would benefit local and national visitors by providing more opportunities for solitude and quiet in the park, but visitors who desire this experience would be disappointed. The local community might be adversely affected if scenic air tour activity concentrated outside the park over populated areas.

Personal Watercraft — The ban would deny the use of personal watercraft to visitors who might enjoy that use. Reduced noise would benefit other visitors who seek a quiet experience in the park. The ban would also improve safety on park lakes. Personal watercraft make up only about 7 percent of the watercraft registered in the United States, but they are involved in nearly 50 percent of boating accidents and a disproportionate percentage of injuries and deaths.

Prior to the imposition of the temporary ban in 1996, a limited number of personal watercraft were operated in the park. Numbers were small, however, and users were often repeat visitors. With such low demand, only a few users would be negatively impacted by the ban and a great number would be affected positively. PWC users could be directed to other more appropriate lakes in the region.

Winter Use — Expansion would have a positive effect on local and national visitors by providing enhanced winter experiences in Glacier National Park that cannot be found elsewhere in the region. Plowing out existing parking lots would provide greater capacity without increasing development. Safer, skiable terrain would be made available by plowing the Going-to-the-Sun Road only to the Lake

McDonald Lodge on the west side and to the 1913 ranger station on the east side and then closing the road to vehicles beyond those points.

Divide Creek Flood Hazard — There would be no impact on national or local visitors.

Construction of a West Side Discovery Center and Museum — The new discovery center and museum would enhance visitor experience by improving information, orientation, and interpretation. Improved information services could reduce congestion along the Going-to-the-Sun Road (including Logan Pass) by diverting visitors to other attractions during periods of peak traffic.

Conclusion. The preferred actions would be expected to significantly enhance visitor use and experience at Glacier National Park. An improved transportation system, the west side discovery center and museum, winter use opportunities, and continued access to overnight accommodations would all contribute to improved experiences for local and national visitors.

Cumulative Impacts. The actions outlined for Glacier National Park taken in context with the already high quality recreational environment of northwest Montana would be expected to further the region as a world-class visitor destination.

Impacts on Energy Consumption

Management Strategy. The management strategy would not adversely affect energy consumption in the park because developed areas would remain but would not be expanded beyond the visitor service zones.

Preservation of the Going-to-the-Sun Road — Reconstruction of the Going-to-the-Sun Road would increase consumption of energy temporarily during the reconstruction period because traffic could be rerouted to Routes 2, 49, and 89, which would increase the distance traveled. Energy consumption would also be increased by idling vehicles that had been delayed by construction. Traffic delays would result in increased energy consumption because vehicles would spend additional time idling during the delays.

Visitor Use on the Going-to-the-Sun Road — The preferred actions for the Going-to-the-Sun Road would continue to offer the road corridor as the primary visitor attraction of Glacier National Park. There would be no significant change in energy consumption. The improved transportation system might reduce use of private vehicles, which would reduce consumption. Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road.

Preservation of Historic Hotels and Visitor Services — The rehabilitation of the lodges would incorporate many energy conserving technologies and would result in a net reduction in energy consumption in the park.

Scenic Air Tours — Banning scenic air tours would reduce the amount of energy consumed in the park, but this would probably be a negligible effect since air tours would be expected to increase outside the park.

Personal Watercraft — Banning use of personal watercraft on the waters of Glacier National Park would reduce energy use.

Winter Use — Increased winter use would result in an increase in energy consumption due to the operation and heating of campstores and increased NPS patrols. The increase would be negligible.

Divide Creek Flood Hazard — Removal of the facilities near Divide Creek would not result in a significant change in energy use since the facilities would be replaced. The new structures would probably be more energy efficient than the old structures, which would result in a modest reduction in energy consumption.

West Side Discovery Center and Museum — The west side discovery center and museum would be heated and air conditioned, which would increase energy consumption. The scale of the increase would depend on the size of the facility and length of time it remained open. Energy saving technologies would be incorporated into the design.

Conclusion. Most of the actions proposed in the preferred alternative would reduce energy use due to new technologies. The winter use actions would, however, result in a net increase in consumption.

Cumulative Impacts. No cumulative impact on energy consumption would result from the preferred alternative.

Impacts on Environmental Justice

Management Strategy. The management strategy would not adversely affect environmental justice because no actions are recommended that would disproportionately affect minority or low income populations. All the actions retain and rehabilitate existing services and structures.

Conclusion. There would be no effect on minority or low income populations.

Cumulative Impacts. There would be no cumulative impacts.

Impacts on Owners of Land in the Park and Adjacent to the Boundary

Management Strategy. The management strategy would not adversely affect the owners of land in the park and adjacent to the boundary because existing developed areas would be retained and private land would not be affected.

Visitor Use on the Going-to-the-Sun Road — Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. If additional development was recommended, landowners would not be adversely affected by the development of new pullouts, trails, and picnic areas or an expanded transportation system because the developments would not occur near private land. However there might be temporary delays for landowners trying to reach their property in the park. Owners of land in and adjacent to the park would not be affected because they are guaranteed access to their property.

Preservation of the Going-to-the-Sun Road — Reconstruction of the Going-to-the-Sun Road could adversely affect landowners in the park, by temporarily delaying access to their properties during reconstruction. Although the road reconstruction is past any private property in the park, landowners could be tem-

porarily delayed by construction equipment and increased congestion. The effects would be temporary and would last only until reconstruction was complete. Owners of land adjacent to the park would not be adversely affected.

Preservation of Historic Hotels and Visitor Services — Landowners in and outside the park would not be adversely affected by rehabilitation of the park's historic hotels and visitor facilities, including new development in some areas.

Scenic Air Tours — Owners of land in the park and adjacent to the boundary would be positively affected by the removal of a source of unnatural noise and the intrusions into the natural scene.

Personal Watercraft — The ban would adversely affect those landowners who would like to use personal watercraft in the park. The ban would have a positive effect on those landowners who object to personal watercraft in the park.

Winter Use — Landowners in the park could be adversely affected by increased winter use of the park, which could increase the risk of vandalism. However, increased activity in the area might discourage acts of vandalism. Increased winter use would have no effect on owners of land adjacent to the park.

Divide Creek Flood Hazard — Landowners in the park would not be affected by removal of the Divide Creek facilities because there is no private land within the park in that area. However, depending on where the facilities are relocated, landowners in and outside the park could be affected. Further analysis would have to be conducted after selection of potential locations.

West Side Discovery Center and Museum — Landowners would not be adversely affected by a new west side discovery center and museum because it would not be constructed on private land.

Conclusion. Landowners would not be adversely affected overall by any of the above actions except expanded day use during the winter, which could increase the risk of vandalism to their properties.

Cumulative Impacts. There would be no cumulative impacts.

The Relationship between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Visitor Use on the Going-to-the-Sun Road — Additional analysis would be conducted; however, if existing pullouts were modified or new pullouts constructed, with associated picnic areas and short trails, it could result in an increased density of development along the Going-to-the-Sun Road, which could have adverse effects on wildlife, particularly grizzly bears, and (in the worst case) it could affect their long-term productivity. For these reasons, the park staff would proceed very cautiously with implementation of this alternative and would conduct studies and analyses as outlined in this document. Further analysis would be conducted as part of the comprehensive use plan for the Going-to-the-Sun Road. Limiting visitor use might benefit the enhancement of long-term productivity.

The Logan maintenance pit is an already disturbed area but provides undeveloped habitat for wildlife, including grizzly bears and the state-sensitive harlequin

ducks. Development of this site would adversely affect long-term productivity for this area.

Winter Use — Glacier National Park provides important habitat for wildlife, particularly prey species, during the winter in the lower elevation valleys throughout the park. Increasing visitor use could have adverse effects on wildlife that depend on these low elevation valleys to survive in the winter. In turn, the predators in the park depend on these prey species for food. Because of these important relationships, the park staff would proceed very cautiously with implementation of this alternative. Wildlife and visitors would be monitored during the winter and if adverse impacts began to occur, management actions would be taken.

Irreversible or Irrecoverable Commitments of Resources Should the Alternative Be Implemented

Preservation of the Going-to-the-Sun Road — A huge financial commitment would be required to implement this alternative. Current funding levels would have to be substantially increased and would probably require a special appropriation from Congress. Expenditures would be an irretrievable commitment of resources.

Preservation of Historic Hotels and Visitor Services — A significant amount of funding would be required to implement this alternative. Expenditures of \$80-\$100 million would be an irreversible and irretrievable commitment of resources.

Divide Creek Flood Hazard — It has been estimated that removal and relocation of facilities would cost be \$10 million. Expenditure of this amount of money would be an irreversible and irretrievable commitment of resources.

West Side Discovery Center and Museum — Development of a westside discovery center and museum would cost approximately \$15 million dollars. This would be an irreversible and irretrievable commitment of resources. Furthermore, although the area north of the T-intersection is surrounded by development and is essentially within a developed area, construction of the visitor center would remove this area as wildlife habitat and revegetation and would be an irretrievable commitment of natural resources.

Adverse Impacts that Cannot be Avoided Should the Action Be Implemented

West Side Discovery Center and Museum — Vegetation would be removed from the site resulting in an unavoidable adverse effect. Vegetation would also be removed from these areas were new pullouts and associated development was constructed. This would be an unavoidable adverse effect.

Impacts of All Other Alternatives

Up to this point, all the preferred alternative impacts have been analyzed as a group, and all the no-action alternative impacts have been analyzed as a group. That format would not be effective for the analysis of the remaining alternatives, which are analyzed under each impact topic below. However, the reader should not consider these actions as a package. For instance, the reader should not assume in this section that the Going-to-the-Sun Road would be reconstructed in $10 \pm$ years and that a discovery center and museum would be built outside the park. The impacts of the management strategy would be the same as stated under the preferred alternative. They are not repeated under each alternative.

IMPACTS ON THE NATURAL ENVIRONMENT

Impacts on Water Resources, Including Water Quality, Floodplains, and Wetlands

Impact Analysis.

Visitor Use on the Going-to-the-Sun Road — If the size of the Logan Pass parking area was increased, groundwater resources could be at risk for direct adverse impacts. If underground parking was created, blasting, digging, and clearing of debris could cause a large amount of erosion during construction and could contaminate water downstream as well as groundwater. If the Logan Pass parking lot was increased horizontally, streams in the immediate area might have to be rerouted, depending on the size of the increase. Rerouted streams would continue to drain into their original drainages. Erosion could also occur during construction to increase the surface area of the lot, which would result in sedimentation of the streams and drainages in the area. This would have adverse direct impacts on water quality. Mitigation measures would be used to protect water quality as much as possible during construction.

If the parking lot was tiered, there would be minimal impacts on water resources and those would occur mostly during construction. After construction was completed, sheet flow from the parking areas carrying oils and antifreeze could adversely affect the quality of both surface water and groundwater. Consultation and a “404 permit” (as required by the Clean Water Act) would be required from the Army Corps of Engineers to implement this alternative.

There are no floodplains and wetlands known in the immediate Logan Pass area. However, if any were discovered, all attempts would be made to avoid these areas.

Modification of existing or construction of additional pullouts, picnic areas, short trails, and interpretive sites at such areas as Moose Country, Lunch Creek, Logan maintenance pit, Sunrift Gorge, Sun Point, and Packers Roost would result in minimal short-term adverse impacts on water quality from construction activity in the area. Mitigating measures such as silt fencing would prevent sediment from entering the adjacent creeks and rivers. After construction was complete, there could be minimal direct and indirect adverse impacts on water quality from sheet drainage from the road, which would release contaminants, such as oil from vehicles, into the creek and rivers adjacent to the road and pullouts. Development would not occur in wetlands near Moose Country and Avalanche to avoid adversely affecting wetlands. There would be no direct or indirect adverse impacts on floodplains associated with these areas. Restroom facilities, roads, trails, and picnic areas are allowed in floodplains and are excepted from compliance with Executive Order 11988.

Preservation of the Going-to-the-Sun Road — (4-6 year and 10± year) Construction activities would disturb soils, which could affect water resources. Riparian wetlands adjacent to the road could also be affected by construction activity. Without mitigation to protect streams, wetland lakes, and rivers adjacent to the Going-to-the-Sun Road, water quality would be adversely affected by increased sediment and turbidity. With mitigation in place, water quality would be protected. Prior to road construction an Army Corps of Engineers 404 permit as defined by the Clean Water Act and state permits would be obtained. Compliance with section 401 of the Clean Water Act would be conducted to determine appropriate mitigation to protect wetlands. These permits define the activity to take place and the mitigation that would be required to protect water quality.

Scenic Air Tour — This would have no effect on water quality, floodplains, or wetlands because the aircraft do not land in the park.

Winter Use — There would be minimal adverse impacts on water resources as a result of winterizing the Village Inn and Lake McDonald Lodge and opening them for year-round use. Adverse impacts could occur in the event of accidental freezing and breaking of sewerlines. No floodplains, wetlands, or other water resources would be adversely affected because no new construction would take place.

Divide Creek Flood Hazard — Hardening the banks and annually removing debris would increase turbidity (stir up sediment) and adversely affect water quality. Using bulldozers and other construction equipment to channelize the creek could also adversely affect water quality from accidental release of gas, diesel, and oil. Channelizing the creek would also create an unnatural floodplain. To prevent catastrophic flooding, annual or biannual maintenance and clearing of the creekbed and maintenance of the channelization structures would be required. The floodplain would be adversely impacted by channelization. The wetlands associated with the creek would also be adversely affected by channelization because the creek course would be controlled, and floods would be avoided.

West Side Discovery Center and Museum — At any site outside the park, careful design and use of the discovery center and control of the well-drilling process could mitigate sediment production, erosion, and other potential sources of water pollution. Construction of the facility and drilling of wells would not violate state surface water quality standards. No site with floodplains or wetlands would be considered, so the discovery center would have no effect on these lands.

Conclusion. There could be significant adverse impacts on the water quality in surface streams, wetlands, lakes, and groundwater from expansion of the Logan Pass parking area. There would be significant adverse impacts on the floodplains, wetlands, and water quality of Divide Creek from channelization. With mitigation such as silt fencing and immediate revegetation, adverse impacts could be reduced.

Cumulative Impacts. Adverse impacts on water quality in the vicinity of Logan Pass, combined with increased development outside the park, would cumulatively adversely impact water quality in the region. Expansion of parking would make it necessary to replace the current sanitation system with a new onsite system; the quality of the groundwater would be at risk of contamination due to shallow soils in the area.

Impacts on Aquatic Resources

Impact Analysis.

Visitor Use on the Going-to-the-Sun Road — Aquatic resources could be at risk if underground parking was created. Blasting, digging, and clearing of debris could cause erosion during construction, which would increase the sediment load and turbidity (stir up sediment) downstream. This would clog the gills of some fish and other aquatic organisms on the bottom of rivers and streams in the area and downstream. If Logan Pass parking lot were to be increased horizontally, streams in the immediate area might have to be rerouted. Significant erosion could result during construction, and sedimentation of the creeks in the area would follow. Mitigation measures would be used to protect aquatic resources as much as possible during construction. A tiered parking lot would have negligible effects on aquatic resources since it is likely that no streams would be disturbed.

After construction, sheet flow from the parking areas carrying petroleum products and antifreeze would adversely affect aquatic resources in the area and downstream. Mitigation would require the use of traps and revegetation.

Aquatic resources could be adversely affected by building pullouts, picnic areas, and trails in areas where there is no current use. Increasing use in these areas and increasing visitation could directly affect aquatic resources such as bull trout, westslope cutthroat trout, and the capshell limpet if people using stream-bank areas increased siltation. During construction of additional pullouts, picnic areas, and short trails, mitigation to prevent increased siltation would protect aquatic resources. Without mitigation, runoff would be increased during the construction period. Small soil particles that do not settle readily reduce light penetration and hinder the growth of aquatic plants and the activities of sight-feeding fish.

High concentrations can clog the gills of aquatic animals and interfere with respiration. Larger soil particles that settle in high concentrations can smother bottom-dwelling organisms and fish eggs. Chronic low level sedimentation can have significant adverse effects on aquatic resources by reducing the diversity and amount of habitat available for aquatic insects and spawning. Mitigation would be conducted to prevent adverse effects on the federally listed bull trout, proposed capshell limpet, and the state-rare westslope cutthroat trout. Further consultation with the U.S. Fish and Wildlife Service during design would ensure protection of these species.

Preservation of the Going-to-the-Sun Road — (4-6 years) During reconstruction of the Going-to-the-Sun Road mitigation would be used to reduce the impacts on aquatic resources. Without mitigation, aquatic resources could be adversely affected by increased sediment and accidental spills of petroleum and other chemical products. The impacts of sedimentation and increased turbidity on rivers and streams would be minimized during reconstruction by erosion control measures. Proper construction management procedures would be used to prevent contamination of adjacent rivers and streams from accidental petroleum spills by construction equipment.

(10± years) During reconstruction mitigation would reduce the impacts on aquatic resources. Without mitigation in place, aquatic resources would be adversely affected by increased sediment and accidental spills of petroleum and other chemicals. The impacts of sedimentation and increased turbidity on rivers and streams would be minimized by effective erosion control. Construction management procedures would be used to prevent contamination of adjacent rivers and streams caused by accidental petroleum spills from construction equipment.

Scenic Air Tours — This would have no effect on aquatic resources because no flights would land in the park.

Winter Use — There would be no additional adverse impacts on aquatic resources as a result of winterizing the Village Inn and Lake McDonald Lodge and opening them for year-round use because the buildings already exist. Some disturbance could result in Snyder Creek if utility lines were buried deeper.

Divide Creek Flood Hazard — Hardening the banks and annually removing debris would increase turbidity and adversely affect aquatic resources by reducing light penetration. This would hinder the growth of aquatic plants and the activities of sight-feeding fish. Although there is unlikely to be a great deal of sediment in Divide Creek, it could have significant adverse impacts on aquatic resources. Chronic low level sedimentation could reduce the diversity of aquatic biota and the habitat for aquatic insects and fish spawning. Using bulldozers and other construction equipment could also adversely affect aquatic resources due to accidental releases of petroleum products.

West Side Discovery Center and Museum — Since the facility would be outside the park, it would not have effects on aquatic resources in the park. If a site was selected adjacent to a river or stream outside the park, aquatic resources could be temporarily adversely affected during construction by increased sediment entering the water course. Mitigation measures would be taken to protect these resources.

Conclusion. There would be significant adverse impacts on aquatic resources from expansion of Logan Pass parking area and from channelizing Divide Creek.

Cumulative Impacts. Channelization of Divide Creek, combined with the flood control activities of private landowners adjacent to the creek outside the park and by the Blackfeet tribe, could result in significant adverse impacts on aquatic resources.

Impacts on Scenic Resources

Impact Analysis.

Visitor Use on the Going-to-the-Sun Road — If the Logan Pass parking area was expanded by adding parking underground, scenic resources would not be adversely impacted. There would be direct, short-term impacts on scenic resources during construction due to the visibility of equipment, waste material, and associated construction activities.

If the Logan Pass parking area was expanded by adding parking horizontally, the scenic resources would be adversely impacted by enlarging the area of asphalt and cars and turning a natural looking area into a developed and hardened area. This would result in an adverse impact on the scenic appeal of Logan Pass. Although the view from Logan Pass would remain unchanged, views of the pass from surrounding peaks and trails would be adversely impacted by an expanded parking lot, associated cars, and more people.

There would be some change in the scenery adjacent to the Going-to-the-Sun Road from the modification of existing or development of additional pullouts, picnic areas, trails, and interpretive sites at areas such as Moose Country, Lunch Creek, Logan maintenance pit, Sunrift Gorge, and Sun Point. Facilities would be designed to blend in with the vegetation and surrounding landscape so that they would not stand out and detract from the scenery. Development of Logan maintenance pit as a parking area for the public transportation system could have a direct adverse impact on the scenic resources in that area. However, this area is well screened from the road and site design would ensure that that this parking area would continue to be screened from the Going-to-the-Sun Road. The parking area would be visible from portions of the Going-to-the-Sun Road above the Loop, from a portion of the highline trail, and from Heaven's Peak. The Logan maintenance pit would also be visible from off-trail locations to the north, south, and east. This would result in an adverse effect on the scenic views from these locations.

Preservation of the Going-to-the-Sun Road —(4-6 years) There could be some localized effects on scenic resources, but panoramic views would not be affected. Construction activity would not be visible to those driving the road if it was closed at Avalanche and at Rising Sun.

(10± years) There would be temporary adverse impacts on scenic resources during construction along the Going-to-the-Sun Road due to construction equipment, but scenic resources would not be permanently affected.

Scenic Air Tour — Allowing the tours in some areas of the park and not in others would adversely affect scenic resources. The visual intrusions would be restricted to certain areas, so the effect would be minimized.

Winter Use — This would not adversely affect scenic resources because no new development is proposed.

Divide Creek Flood Hazard — Channelizing Divide Creek would adversely affect scenic resources by creating a very unnatural appearing creekbed. The presence of equipment in the creekbed once or twice a year and the construction of a permanent access point into the creek would adversely affect scenic resources in the area.

West Side Discovery Center and Museum — This would not have an adverse impact on scenic resources inside the park. Scenic resources outside the park could be adversely affected if the facility was located in an undeveloped area, which would contribute to the strip development occurring outside the park. That development is of a different character than was traditional for the area. Locating the center in an already developed area outside the park would not adversely affect scenic resources.

Conclusion. Expansion of the Logan Pass parking lot aboveground (horizontally or tiered) would have a significant adverse impact on the scenic resources in the area. Expansion of the Logan Pass parking lot below ground would have a temporary adverse impact on the scenic resources of the area during construction. After construction was complete, there would not be an adverse impact on scenic resources. The design would have to be compatible with other development in the park. There are no other underground parking structures in the park.

Channelizing Divide Creek would have an adverse impact on scenic resources in the immediate area because it would be unnatural in appearance, but it could be an improvement on the existing flood abatement structures.

Cumulative Impacts. Channelizing Divide Creek could have a positive cumulative effect on scenic resources when combined with actions taken by private landowners adjacent to the park and the Blackfoot Tribe. Currently, the tribe and the adjacent landowners take actions to control the flooding of the creek. These actions and associated developments create an unnatural looking landscape that adversely affects scenic resources in the area. Channelization of the creek near St. Mary could result in decreased flood control measures by others.

Development of a west side discovery center and associated parking outside the park combined with development by other landowners adjacent to the park, could have a cumulative adverse impact on scenic resources. It would increase the density of development along Highway 2 and contribute to the change of a relatively natural view with scattered developments to continual development from West Glacier to Hungry Horse.

Impacts on Air Quality

Impact Analysis.

Visitor Use on the Going-to-the-Sun Road — Expanding the Logan Pass parking lot above or below ground would temporarily adversely affect air quality, releasing more particulates into the air from construction equipment and dust. Flathead County is currently out of compliance with state air standards for particulate emissions, and this activity would contribute to the inability of the county to comply with the standard. Impacts would be similar to those described under the preferred alternative, “Environmental Impacts on Air Quality.”

Although the amount of carbon monoxide emitted would continue to increase as visitation increased, this would not affect the state’s ability to maintain conformity with the required air quality standards.

Preservation of the Going-to-the-Sun Road — (4-6 year and 10±) Road construction would be done in accordance with guidelines and regulations to ensure continued maintenance of national air quality standards for motor vehicle-related pollutants such as ozone and carbon monoxide. Operation of a batch plant in or near the park during repaving would contribute to the increase in particulate matter on the west side of the park. Consultation and approval by the state would be required prior to placement and operation of a batch plant.

Scenic Air Tours — This would have a negligible adverse impact on air quality, because aircraft emissions are very slight compared to the total air mass.

Winter Use — Increased traffic in the valley in winter could increase air pollution in the McDonald Valley. In winter, inversions cause air to settle for longer periods in the valleys rather than being blown away. However, it is unlikely that air quality standards set by the state of Montana in accordance with the Environmental Protection Agency would be violated. Localized air quality could be degraded for longer periods than under the no-action alternative. Smoke from lodging facilities could be present on a year-round basis. Impacts could be more severe if winter inversions trap particulates in lower air layers for extended periods of time.

Divide Creek Flood Hazard — Air quality would be temporarily adversely affected by vehicle emissions if heavy equipment was used to clear the creekbed. These impacts would not be significant.

West Side Discovery Center and Museum — During construction, air quality would be temporarily adversely affected by the operation of heavy equipment. Diesel fumes and particulates would be released into the air. It is unlikely that this activity would cause a violation of state air quality standards. Operation of a discovery center would not adversely impact air quality in the park or in the surrounding area.

Conclusion. Air quality would not be significantly adversely affected by any of these alternatives. Temporary impacts on air quality would occur during reconstruction of the Going-to-the-Sun Road and expansion of Logan Pass parking lot.

Cumulative Impacts. Actions taken in the park would not cause or contribute to poor air quality in the region; there would be no cumulative impacts.

Impacts on Wildlife, Including Federally Listed Threatened and Endangered, Federally Proposed, and State Rare Species

Bald Eagles.

Visitor Use on the Going-to-the-Sun Road — The Logan Pass parking lot is not in bald eagle habitat. Expansion of the parking lot would not adversely affect bald eagles.

The removal of trees and other vegetation for the development of pullouts, picnic areas, and short trails along the east shore of Lake McDonald and the north shore of St. Mary Lake could result in the loss of eagle foraging habitat by removing perch trees and screening vegetation. A park wildlife biologist would participate in the site selection and design of these developments to avoid known foraging or roosting areas and minimize impacts on eagles. Informal pullouts (created by visitors without regard to potential eagle use) would be obliterated.

Operation of an expanded transportation system would not adversely affect bald eagles. Any additional parking facilities would not be located in known bald eagle nesting, foraging, or roosting areas.

As visitor use increased along the Going-to-the-Sun Road, more visitor use could occur in eagle habitat (such as along lakeshores), and the disturbance of bald eagles could increase. Nest site management plans, visitor use restrictions, and education efforts would be implemented to minimize these impacts. Providing additional designated pullouts along the road that were sited to avoid preferred eagle use areas would reduce the creation of informal pullouts and direct visitors to more appropriate and less sensitive locations.

Preservation of the Going-to-the-Sun Road — (4-6 year and 10± year) Reconstruction of the Going-to-the-Sun Road would primarily occur along the higher elevations outside eagle habitat. Reconstruction of the lower sections of the road could temporarily displace eagles depending on the location and the time of year of construction. No construction activity would occur within 0.5 mile of known nest sites but would occur within the larger home range of each nest as well as in foraging habitat. Timing construction activities to take place only during certain times of the year and during specific times of day would mitigate impacts. Most construction would occur during the summer. Restrictions on construction activity would be imposed during sensitive nesting periods to avoid adverse effects.

Scenic Air Tours — Bald eagles would probably benefit if scenic air tours were restricted near eagle habitat, because human disturbance would be reduced. However, increased low level flights in the Going-to-the-Sun Road corridor could adversely affect nesting and migrant eagles in that area in ways similar to the no-action alternative.

Winter Use — Expanding winter use opportunities including overnight accommodations at Lake McDonald, would increase the numbers of visitors and

their lengths of stay in this area during the most sensitive time of the eagle nesting period (March-May) as well as during the stressful winter period. Disruption of early nesting activity and incubation caused by human activity would increase the chances of nest abandonment or failure. Increased visitor use would also increase disturbance or displacement of birds during critical winter and migration periods. Visitor use restrictions, including site-specific closures during specific time periods, would be implemented; however, this alternative would have the most potential for disturbance to eagles.

Divide Creek Flood Hazard — Channelizing Divide Creek to protect the existing development would not affect eagles because there is no known nesting or other eagle use in that area.

West Side Discovery Center and Museum — Development of a west side discovery center outside of the park would not affect bald eagle use in the park. Depending on where the facilities were relocated, bald eagle habitat and use outside of the park could be affected. Further analysis would be completed as part of the site selection process.

Gray Wolves.

Visitor Use on the Going-to-the-Sun Road — Expansion of the Logan Pass parking area would not affect wolves because it is not in wolf habitat. Increasing use in the Going-to-the-Sun Road corridor would have similar effects as under the no-action alternative.

Wolves could be indirectly affected by increasing the number of developments (pullouts, short trails, picnic areas, and transportation system parking) along the Going-to-the-Sun Road in the St. Mary Valley, where there is evidence that wolves are recolonizing. Increasing development along the Going-to-the-Sun Road could displace elk that feed in the meadows. This could in turn reduce prey availability if prey numbers declined as a result of lost foraging opportunities in productive meadow areas or if animals were displaced to areas outside the park where they could be killed by hunters. It is anticipated that displacement effects would be minor and that elk would habituate to increased use. However, habituated elk and deer might be less vulnerable to wolf predation because wolves are less likely to habituate to increased human use; habituation of ungulates could result in reduced prey availability.

Additional developments would be limited in their placement, would primarily use already popular use areas along the road, and would not be sited in meadows or riparian areas. A park wildlife biologist would participate in the site selection and design of these developments to minimize impacts on wildlife.

Preservation of the Going-to-the-Sun Road — (4-6 year and 10± year) Reconstruction of the Going-to-the-Sun Road could temporarily displace wolves and prey species near construction, although most of the reconstruction would take place outside of known wolf habitat. Wolves in less used areas of the park could be adversely affected if visitors were displaced from the Going-to-the-Sun Road corridor during construction and temporarily began using other areas of the park.

Scenic Air Tours — Wolves would probably benefit in the areas where scenic air tours were restricted by decreasing the potential for disturbance. However, wolves could be adversely affected in the areas where flights were allowed (see the no-action discussion of effects).

Winter Use — Expanding winter opportunities would have the same effects as under the proposed action for plowing roads and parking areas. Wildlife could be displaced and feeding activity could be disrupted in some areas, especially with increased use. Overnight accommodations at Lake McDonald and Apgar would have no effect unless wolf activity increased in these areas.

Divide Creek Flood Hazard — Channelization of Divide Creek would not affect wolves because wolves do not use this developed area.

West Side Discovery Center and Museum — Development of a west side discovery center outside of the park would not affect wolf use in the park. Depending on where the facilities were located, wolf habitat and use outside of the park could be affected. Further analysis would be completed as part of the site-selection process.

Grizzly Bears.

Visitor Use on the Going-to-the-Sun Road — The Logan Pass area is high-quality summer habitat for grizzly bears because of the availability of preferred foods. Currently bears either are displaced from the area or become habituated to visitors. An expanded parking lot would have a temporary adverse impact on grizzly bears because bears could be further displaced from the area by construction activity and blasting. Expanded visitor use at Logan Pass could also lead to further habituation for some bears, increasing human/bear conflicts that can ultimately result in bear removal or death.

Grizzly bears could be indirectly adversely affected if increased visitor use caused people to disperse into other areas around Logan Pass, especially off-trail areas. Grizzly bears tend to habituate to predictable patterns of use in location and time. They learn that people frequent developed areas and trails, and they tend to avoid such areas. Because people do not normally frequent off-trail areas, bears do not expect to find them there and may be startled and react aggressively when encountered. Expanded visitor use at Logan Pass could also result in the displacement of bears to less productive habitat, thus negatively affecting their survival and reproduction.

Increasing visitor use resulting in more pullouts, picnic areas, and trails along the Going-to-the-Sun Road could adversely affect grizzly bears. Impacts could include increased habituation through human contact and food attractants or displacement, which would result in an effective decrease in usable habitat. Increased habituation could lead to increased human/bear contacts and conflicts that could ultimately result in the removal or death of bears. Additionally, greater development in the road corridor could create a barrier to grizzly movement. Bears could alter their use of areas near roads from daylight to night, allowing some continued use of habitat near roads and crossing opportunities. Further analysis and studies

would be completed to determine the specific locations, numbers, and sizes of new developments based on minimizing impacts on bears and avoiding known grizzly bear crossing corridors.

Transportation system parking could indirectly affect bears if visitors used parking and bus pickup areas in the early morning or evening when bears are most active. This could result in increased encounters between people and bears. Studies on bear road crossings would be used to site the parking areas. Parking at Logan maintenance pit would result in the loss of suitable summer habitat. Bears would be displaced from this area or possibly would become habituated to visitor use. Parking at Sun Point would probably not affect bears because the area is already developed. Increasing visitor use could have an effect on bears through increased bear/human encounters.

Preservation of the Going-to-the-Sun Road — (4-6 years) Reconstruction of the Going-to-the-Sun Road would temporarily displace bears from areas under construction. Closure to through-traffic could benefit bears by effectively closing part of one side of the park to vehicles for two years. This would reduce disturbance to bears and the potential for bear/human encounters. Reconstruction over a shorter timeframe would also benefit bears by reducing the overall length of construction disturbance along the road. Grizzly bears in less frequented areas of the park could be adversely affected as visitors displaced from the Going-to-the-Sun Road corridor began to use other areas such as Many Glacier, Two Medicine, the North Fork, and Cut Bank in greater numbers.

(10± years) The effects of accelerated reconstruction of the Going-to-the-Sun Road would be similar to those described under the no-action alternative because construction methods would be similar. However, construction would be completed in a shorter time frame than the no-action alternative, which would have fewer adverse effects on bears.

Scenic Air Tours — Bears would probably benefit where scenic air tours are restricted because of decreased disturbance. However, concentrated operations or increased frequencies in other areas could adversely affect bears, (see discussion under the no-action alternative).

Winter Use — Winter or year-round operation of the Village Inn and Lake McDonald Lodge could result in increased human/bear conflicts in the spring and fall. Repeat encounters would result in hazing or relocation. Survival and reproduction can be affected by displacement to less productive habitat. Increased visitor use in spring, summer, and fall would result in greater potential for human/bear conflicts in areas surrounding developed sites in the park.

Divide Creek Flood Hazard — Channelization of Divide Creek would not affect bears because bears do not frequent this developed area.

West Side Discovery Center and Museum — Depending on where the new west side discovery center was located, bear habitat and use outside the park could be affected. Further analysis would be completed as part of the site selection process.

Peregrine Falcons.

Although suitable habitat exists in many locations throughout Glacier, this species is rarely recorded in the park and there are no known park nest sites. No effect on this species would be expected.

Federally Proposed Species*Lynx.*

Expansion of the Logan Pass parking area or channelization of Divide Creek would not affect lynx because the actions would not affect suitable habitat. Based on very limited information on lynx use in the park, it is believed that they could be adversely affected if winter use increased significantly in areas such as the McDonald Valley, the east side of the park, and other suitable coniferous forest habitats. Lynx could benefit from restrictions on overflights by decreasing the potential for human disturbance. Lynx would probably not be affected by development of a west side discovery center outside of the park, depending on its location. Further analysis would be completed as part of the site selection process.

Visitor Use on the Going-to-the-Sun Road — Lynx would probably not be affected by construction of facilities in areas or corridors of development and concentrated use because there is little documentation of lynx using roadside areas. This would include construction of additional pullouts, picnic areas, trails, and transportation system parking along the Going-to-the-Sun Road, or the reconstruction of overnight facilities at Many Glacier, Rising Sun, and Swiftcurrent and other visitor facilities.

State-Listed Rare Species*Marten, Fisher, and Wolverine.*

Increasing day and overnight winter use in the lower elevations of the park would further reduce habitat suitability and use (see no-action alternative discussion).

There would be no effect on the other state-listed species, although these species could benefit from restrictions on overflights.

Conclusion. Bald eagles could be negatively impacted by increasing levels of human use near Lake McDonald and St. Mary Lake. Of particular concern are impacts on eagles associated with increased levels of human use in the Lake McDonald Lodge area during the eagle nesting period. Some impacts on eagles could be mitigated by area closures around nest sites. As overnight use increased during winter, wolves and their prey could be displaced in the Many Glacier and St. Mary Valleys and in the lower North Fork Valley. Grizzly bears could be negatively impacted by parking lot expansion, increasing levels of visitor use at Logan Pass and the reconstruction of the Going-to-the-Sun Road. Grizzly bear impacts

include habituation for some bears, displacement, disruption of travel patterns, and increased frequency of bear/human encounters. Bears and eagles would benefit from reduced human disturbance if scenic air tours were banned over selected portions of the park; however, impacts on bears and eagles would continue in areas where scenic air tours were allowed.

Cumulative Impacts. *The Grizzly Bear Recovery Plan* for the Northern Continental Divide Grizzly Bear Ecosystem Management Area, as developed by the U.S. Fish and Wildlife Service and the Interagency Grizzly Bear Committee (in which the park staff participates), outlines the park's responsibility for actions necessary for the conservation and recovery of the grizzly bear. Implementation of this plan would result in positive cumulative benefits for the recovery of the grizzly bear.

The actions called for in the *Montana Bald Eagle Management Plan*, completed by state and federal agencies with private landowners, would result in positive cumulative impacts on the recovery of the bald eagle in the ecosystem. The management goal for Montana is to provide secure habitat for bald eagles and to maintain a viable, healthy, and self-sustaining population. However, productivity (the number of young produced and fledged) of eagle nests in the park is poor and is below the level established for recovery of the species. The low productivity is attributed to a relatively short nesting season, a decline in native fish populations, and recreational facility development and associated use in the nesting territories.

The implementation of actions called for in the *Northern Rocky Mountain Wolf Recovery Plan* would result in positive cumulative impacts for the gray wolf. A viable prey base and secure denning areas are particularly important. Disruption of prey, particularly on winter range, coupled with continued development outside the park, could have adverse cumulative effects.

Management actions as proposed in these other alternatives and actions outside the boundary, such as coal mining and logging in British Columbia and on national forest lands in the United States, increased private development in the North and Middle Fork Valleys and the corridor between West Glacier and Columbia Falls, increased freight train traffic carrying hazardous materials and grain, and gas and oil leases and private development on the Blackfeet Indian Reservation, could cumulatively affect wildlife populations and habitat. Because the park is not large enough to support sustainable populations of all these species, the impacts could be cumulative and adverse. Cumulative impacts on fall, winter, and spring habitat could be greater for the winter use proposal in these alternatives than in the no-action alternative or the preferred

Impacts on Wildlife Other than Listed Species

Impact Analysis

Visitor Use on the Going-to-the-Sun Road — Expanding parking at Logan Pass would remove habitat and displace bighorn sheep, mountain goats, and white-tailed ptarmigan that inhabit the area. Those species that were not displaced would

habituate to increased numbers of people. Habituated ungulates might have to be trapped and relocated. Expansion of the parking lot underground would remove less habitat than expanding the lot aboveground.

Increased use of the Going-to-the-Sun Road and the new pullouts, trails, and picnic areas along the road would result in further loss of habitat and disturbance of various wildlife species that live or travel close to the road. Ungulates would probably be displaced from areas adjacent to the road, but their distribution would probably not be affected. There would be minor displacement of ungulates along roadsides. Habituated ungulates might have to be trapped and relocated from some roadside areas.

Preservation of the Going-to-the-Sun Road — (4-6 years) Reconstruction of the Going-to-the-Sun Road would temporarily adversely affect wildlife species that live or travel near or cross the road. Wildlife would be temporarily displaced during construction. No long-term effects are expected. Closing one side of the road during reconstruction for about two years would benefit wildlife because there would be less human activity in the closed area. However, wildlife could be temporarily affected by increased visitation in other areas of the park during reconstruction.

(10± years) Reconstruction of the Going-to-the-Sun Road would temporarily adversely affect wildlife species that live or travel adjacent to or across the road. Wildlife would be temporarily displaced during construction. No long-term effects are expected.

Scenic Air Tours — Wildlife in the areas where air tours were restricted would benefit from the reduction in disturbance. Wildlife in the areas where scenic air tours concentrated or operated more often would be disturbed and possibly displaced.

Winter Use — Continued and increased winter use in the lower elevations of the park would adversely affect wildlife that are active in the winter, potentially displacing them from areas near roads, trails, and developed areas. It could also result in habituation and could lead to more conflicts with habituated wildlife. Plowing access roads into the park could increase illegal hunting. Wildlife would be subject to additional human-induced stress during an already vulnerable time in the fall, winter, and spring. Animals remaining in the area would expend more energy avoiding intrusion, and this could affect survival and reproduction. Potential effects would probably be accentuated by naturally difficult times such as severe winters. This alternative would have a greater potential to impact wildlife than the other alternatives because the degree of human activity would increase and the timeframe of that activity would be extended to day and night and into the winter and shoulder seasons.

Divide Creek Flood Hazard — Channelization of Divide Creek and continued use of the developed area would not have any additional effects on wildlife. Animals would continue to avoid this area of concentrated human activity.

West Side Discovery Center and Museum — Development of a west side discovery center outside of the park could affect wildlife habitat depending on where

the facilities were relocated. Further analysis would be completed as part of the site selection process.

Conclusion. Construction associated with expansion of Logan Pass parking lot and road reconstruction would result in temporary disturbance and displacement for many species and a small amount of habitat loss for some species. Increasing winter use could cause displacement and stress for such animals as deer, elk, and mountain lions that concentrate in lower elevation valleys during the winter. Many species, especially those that summer at higher elevations, would benefit from reduced human disturbance by the banning of scenic air tours over selected portions of the park; however, wildlife impacts would continue in areas of the park where scenic air tours were still allowed.

Cumulative Impacts. Management actions as proposed in these other alternatives and actions outside the boundary, such as coal mining and logging in British Columbia and on national forest lands in the U.S., increased private development in the North and Middle Fork Valleys and the corridor between West Glacier and Columbia Falls, increased freight train traffic carrying hazardous materials and grain, and gas and oil leases and private development on the Blackfoot Indian Reservation, could cumulatively affect wildlife populations and habitat. Because the park is not large enough to support sustainable populations of all these species, the impacts could be cumulative and adverse. Cumulative impacts on fall, winter, and spring habitat could potentially be greater for the winter use proposal included in these alternatives than the no-action alternative or the preferred.

Impacts on Vegetation, Including Species at Risk and State and Park-Rare Plant Species

Impact Analysis.

Visitor Use on the Going-to-the-Sun Road — Expanded development in the Logan Pass area would completely destroy vegetation in the area to be paved. Construction inside the current footprint would cause short-term impacts on vegetation in the surrounding area from trampling. Groundbreaking and other construction-related activity would, for the short-term, increase the chances for the introduction and spread of noxious weeds and other exotic plants. Construction areas would be limited to the minimum necessary to complete the project.

Expanding Logan Pass parking lot could have a direct adverse impact on one species at risk, the lens-fruited sedge (*Carex lenticularis* var. *dolia*) and one state-rare plant, the Mingan Island moonwort (*Botrychium minganense*). These two plant populations would be avoided or, as a last resort, moved to similar habitat to avoid adversely affecting them. Survival rates for transplanted populations are unknown.

An indirect adverse effect of expanding Logan Pass parking lot would be increased visitation in the area. More people would be in the area at any given time, which could cause management problems, including overloaded facilities. With the increase in numbers, people might be less likely to stay on the boardwalk and other designated trails. Off-trail use in the area has the potential to adversely

impact two species at risk, the lens-fruited sedge and alpine glacier poppy. State-rare plant species that could be adversely impacted are the three-flowered rush, little false asphodel, and Mingan Island moonwort. Management actions would be taken to protect these species.

Modifying existing or constructing additional pullouts, picnic areas, and trails along the Going-to-the-Sun Road would not affect any known population of rare plants; however, additional use at these areas could have adverse impacts. Mitigation, such as changing the location of a pullout, modifying design, or limiting the areas open to visitors outside the developed area, would reduce adverse effects. Alpine glacier poppy and lens fruited sedge (species at risk) and three-flowered rush, little false asphodel, mingan island moonwort, lyre-leaf rockcress, and northern eyebright (state-sensitive species) could be affected. Each area would be surveyed prior to development of a site design to ensure that all plant locations were noted. The site design would avoid all known rare plants. As a last resort, rare plants that could not be avoided would be moved to suitable and similar habitat nearby. These actions would ensure that there would not be significant adverse impacts on rare plants. Marking the plant locations during construction would protect these species from accidental trampling.

Preservation of the Going-to-the-Sun Road — (4-6 years and $10 \pm$ years) The same plants could be adversely affected by reconstruction of the Going-to-the-Sun Road. Mitigation would be implemented to avoid adversely affecting these plants. It could include either marking the site to be avoided or, as a last resort, relocation of the plants to similar habitat. Transplanting of rare species has not been done at Glacier. The success rate of this mitigation would have to be evaluated. There could be some adverse effects on the Cedar-devils Club habitat at Avalance from using this and as a closure point for two years during reconstruction. However, it is unknown at this time exactly how Avalance would be modified or more parking would be provided.

Scenic Air Tours — Species at risk or state-rare plant species would not be adversely affected because the aircraft do not land in the park.

Winter Use — Species at risk or state-rare plant species would not be adversely affected because they are dormant in the winter.

Divide Creek Flood Hazard — No species at risk or state rare plants are present.

West Side Discovery Center and Museum — There is one known state-listed rare plant, but there are no federally listed species at risk in the area. During design and site selection, areas would be surveyed. Any threatened or endangered species or species at risk found would be avoided or, as a last resort, moved to similar habitat to avoid adverse effects. The state-listed rare plant would be avoided, or, as a last resort, moved to similar habitat to avoid adverse effects.

Vegetation (General).

Visitor Use on the Going-to-the-Sun Road — Vegetation in the area would be adversely affected if the parking lot was expanded on the surface. It is not known

how many acres would be affected. If the parking lot is expanded underground, vegetation would be adversely affected during the construction period, but areas would be revegetated when construction was completed. Vegetation could be adversely affected by increased trampling due to the increased numbers of visitors in the area. If the parking lot was tiered aboveground, vegetation would only be adversely affected temporarily during construction. The size of the expanded parking lot would be limited to the minimum necessary. All disturbed areas not covered by development would be reseeded with native species to speed the rate of recovery and to minimize the invasion of exotic species.

Approximately 0.25 acre of vegetation per site along the Going-to-the-Sun Road would be removed or adversely impacted for development (pullouts, trails, and picnic areas), but this would not be a significant adverse impact. The amount of vegetation would vary by the size of the site depending on the parking capacity, type of activity, resources at the site, the vegetation and soil conditions, and the degree of development already in place at each of the sites. Vegetation may be affected outside the immediate area as a result of social trails. Each area would be examined for trail development potential to minimize social trail development. Visitors would be instructed to remain on established trails. Vegetation along the road would be positively impacted by controlling the amount of trampling and damage that was done by visitors who stop on the side of the road. Since Logan maintenance pit is an already disturbed area and largely cleared of vegetation, vegetation would be minimally adversely impacted.

Preservation of the Going-to-the-Sun Road — (4-6 years and $10 \pm$ years) Some vegetation would be adversely affected along the Going-to-the-Sun Road during reconstruction, but this would probably not be significant. This loss of vegetation could be mitigated by restoration of all locations along the road that were adversely affected by construction.

Scenic Air Tours — Vegetation would not be adversely affected because the aircraft do not land in the park.

Winter Use — Vegetation would not be adversely affected because plants are dormant in the winter, the area is snow-covered, and no new facilities are contemplated.

Divide Creek Flood Hazard — Riparian vegetation would be adversely affected by channelizing the creek because the banks would be hardened and vegetation would be removed.

West Side Discovery Center and Museum — Vegetation inside the park would not be adversely affected. Vegetation outside the park would be adversely affected in the area chosen for development.

Conclusion. Expanding Logan Pass parking lot would adversely affect one species at risk and one state-rare plant. It would also affect other vegetation in the area. Areas surrounding facilities at Logan Pass could be affected by increased numbers of people and more off-trail use. This would cause soil compaction and change the amount of moisture available to plants, which in turn might alter the relative abundance of some species and affect germination. Plants that invade disturbed areas might become more common. Increased erosion might lead to expo-

sure of root systems and the subsequent loss of more mesic plants. The impacts of trampling would range from complete exclusion of vegetation to slight shifts in species composition. Eliminating the need for off-road parking would have a positive effect, decreasing trampling of vegetation.

New or expanded development in areas that have rare plant populations would adversely affect these resources unless the plants in those areas were avoided or replanted in suitable habitat.

All disturbed areas not covered by development would be reseeded with native species to speed the rate of recovery and to minimize the encroachment of invading species.

Cumulative Impacts. Several of the rare and sensitive species in the park are found in few other locations in the region, so minor impacts on a few individual plants could have serious adverse impacts on some these species.

Impacts on Soils

Impact Analysis.

Visitor Use on the Going-to-the-Sun Road — Logan Pass contains moderately deep and shallow limestone soils that are rated low for road and trail construction due to their limited depth. These soils are also rated low in productivity and low for revegetation due to their high rock content and moderate erosion potential. During construction, measures would have to be taken to prevent loss of soils and to protect surrounding streams from erosion. After construction, extra care and expense would be needed to ensure that revegetation efforts were successful. The subsoil materials just above the fractured bedrock are well suited to road and trail construction because of the high rock content and good drainage. Expanding Logan Pass parking lot below ground would not adversely affect surface soils except during construction. The subsurface soils and bedrock would be significantly adversely impacted due to blasting and removal of material. Blasting could cause increased fractures in the bedrock surrounding the developed area, adjacent to the parking lot. All of the possible effects of increased fracturing are unknown, but it could lead to instability of the road and visitor center. Expanding Logan Pass parking lot by building a tiered lot would not adversely affect soils except during construction if work was necessary beyond the parking area.

The development of additional pullouts, picnic areas, restrooms, a large parking area at Logan maintenance pit, and short trails along the Going-to-the-Sun Road would result in adverse impacts on soils. There would be soil compaction at all sites developed for visitor use, and development would remove them from production of natural vegetation. Soils throughout the road corridor are moderately susceptible to weed invasion. Soils on the east side are more subject to erosion than on the west side, so during construction soils would be adversely impacted by erosion on the east side unless mats for stabilization, immediate revegetation, and other mitigation measures were used. The shallow soils in the Lunch Creek area would make revegetation and control of erosion critical during construction. These

soils are suitable for trail development. The soils on the west side of Logan Pass are moderately suitable for waste disposal such as septic tanks; however, in the Road Camp area on the west side, the soils are shallow with a low water-holding capacity. On the east side of the pass soils are not suitable for waste disposal in the higher elevations due to the shallow depths and low rock content. Soils in the lower elevations on the east side around St. Mary Lake are moderately suitable for waste disposal.

Preservation of the Going-to-the-Sun Road — (406 years and $10 \pm$ years) The effects of reconstructing the Going-to-the-Sun Road would be similar to those in the no-action alternative.

Soils would be adversely affected during road reconstruction. Adverse effects would be temporary and most would be mitigated to reduce the amount of sediment entering water courses. All soils on which the vegetation has been removed would be revegetated, which would protect the soils from wind.

Scenic Air Tours — This would not adversely affect soils because aircraft do not land in the park.

Winter Use — Placing water and sewerlines deeper into the ground for the Lake McDonald Lodge and the Village Inn would disturb soils but would not adversely impact them, since these soils were disturbed when the lines were originally installed.

Divide Creek Flood Hazard — Rocky and sandy alluvial grassland soils would be adversely impacted by the channelization of Divide Creek. Annual work using heavy equipment and the initial construction would each have effects. These soils are highly susceptible to invasion by weeds and have a moderate erosion potential. Annual expenditures would be necessary to maintain the area, keep it free from exotics, and ensure the success of native vegetation.

West Side Discovery Center and Museum — Soils inside the park would not be adversely affected. Soils outside the park in the area to be developed could be adversely affected. Analysis would be done after a site is chosen.

Conclusion. Soils in the Logan Pass and the Divide Creek areas would be adversely affected by expanded development. Soils along the Going-to-the-Sun Road would be temporarily affected, but mitigation would reduce the effects.

Cumulative Impacts. There would be no regional cumulative impacts on soils from development in the park.

Impacts on Natural Sounds

Impact Analysis.

Visitor Use on the Going-to-the-Sun Road — During construction, noise levels would increase in the Logan Pass area, adversely affecting natural sounds. After construction was completed, the ability to hear natural sounds would be restored. During times of high visitation in the Logan Pass area, natural sounds would be adversely affected by vehicle noise and by the large numbers of people.

Modification of existing and construction of additional pullouts would temporarily increase noise levels in the park, reducing the natural quiet in the park.

Preservation of the Going-to-the-Sun Road— (4-6 years) Noise levels would temporarily increase in the park along the road corridor and adversely affect natural sounds. The effects would be negligible because only a few visitors would be in the construction area and fewer years would be spent on the construction.

(10± years) Noise levels would temporarily increase in the park along the road corridor, adversely affecting natural sounds.

Scenic Air Tours — Natural sounds would continue to be adversely affected and noise levels would increase in those areas of the park where air tours were permitted. Management of scenic air tours would increase opportunities to hear natural sounds in other areas of the park. Directing air tours over areas such as the Going-to-the-Sun Road would incrementally add to the noise in that corridor, further masking and adversely affecting natural sounds and the ability to hear them.

Winter Use — Providing more winter opportunities, including overnight accommodations, would probably have a negligible effect on natural sounds. Concentrated use would focus around existing developed areas.

Divide Creek Flood Hazard — Natural sounds would be adversely affected temporarily during construction to complete the channelization. Annual work inside the creek would be noisy and would temporarily adversely affect natural sounds.

West Side Discovery Center and Museum — Natural sounds inside the park would not be adversely affected.

Conclusion. Natural sounds would continue to be adversely affected by scenic air tours in some areas, which would worsen in areas with high concentrations and improve where the flights were restricted. Increased visitation at Logan Pass would also increase noise.

Cumulative Impacts. Limiting scenic air tours in the park might increase their frequency outside the park and the industry could expand. This could result in a cumulative impact on natural sounds.

Impacts on Biological Diversity

Impact Analysis.

Visitor Use on the Going-to-the-Sun Road — Impacts on biodiversity would include the removal of fragile alpine vegetation, which would impact a limited park ecosystem. This plant community has evolved over thousands of years to extremely harsh climatic conditions. Once disturbed, the diversity of such communities takes far longer to become reestablished than would similar disturbance at lower elevations. Wildlife, including grizzly bears, would be impacted by construction-related noise and by the expansion of the area of disturbance at Logan Pass. The Logan Pass area provides very important summer feeding areas for bears and other species and is a natural wildlife corridor.

The modification of existing or development of additional pullouts, picnic areas, parking, and trailheads along the Going-to-the-Sun Road might not adversely affect biodiversity by contributing to additional habitat fragmentation. The vegetation disturbance or removal that often accompanies construction could also provide optimal conditions for exotic species to grow and spread if not contained by aggressive management actions. The presence of exotic species reduces biodiversity in plant communities.

Biological diversity could also be reduced if new roadside facilities result in damage to or removal of portions of sparsely distributed plant communities such as the mature cedar-hemlock forests in the McDonald Valley.

The development of additional pullouts, picnic areas, and trailheads along the Going-to-the-Sun Road has the potential to disturb feeding, nesting, or roosting bald eagles and to reduce the chances for reproductive success. Similarly the development of new trails along the Going-to-the-Sun Road has the potential to displace grizzly bears and to increase human-bear encounters. These actions could adversely affect biodiversity in the long run. Wildlife travel corridors could be disrupted and the use of feeding areas could be precluded.

Preservation of the Going-to-the-Sun Road — (4-6 years) Reconstruction activities could have a minor impact on biodiversity by displacing wildlife from the reconstruction areas and by obstructing wildlife movement and migration. This could be especially true for grizzly bears that use high elevation habitat along the road during the time when reconstruction would occur. Diversity of roadside plant communities could also be slightly impacted because ground disturbance provides optimal growing conditions for exotic plants. Impacts on animal biodiversity would be partially mitigated by closures of portions of the road to visitor traffic. Impacts on plant biodiversity would be partially mitigated by aggressive management actions, including prompt revegetation with native species and the use of selective herbicides.

Impacts under a $10 \pm$ year would be the same as those from the 4-6 year reconstruction alternative.

Scenic Air Tours — The noise of scenic air tours indirectly impacts biological diversity. Specific impacts include dispersal, interruption of courtship behavior, disturbance during critical feeding periods (early spring and fall), and increased energy expenditure.

Excluding scenic air tours from the North Fork, Middle Fork, Two Medicine, Goat Haunt, and Belly River areas should result in less impact on biodiversity.

Winter Use — Increased and dispersed winter use should have little or no impact on the diversity of plants or plant communities in the park. The proposed changes could, however, result in long-term impacts on animal biodiversity.

During the winter many species concentrate in lower valleys where there is less snow and where food is more likely to be found. This is especially true for ungulates such as elk and deer and for the wolves and cougars that prey on them. Keeping selected lodges open in the winter or plowing additional roads could result in temporary displacement of such species from their winter ranges. This would cause additional energy consumption at a time when the animals are already

under climatic stress and when food is limited. For threatened and endangered species such as the wolf and for species of concern such as the wolverine and lynx (species whose numbers in the park are already very low [Yates 1994]) the additional stress caused by increased human presence during the winter could cause such populations in the park to decrease.

Divide Creek Flood Hazard — Channelization impacts the biological diversity of aquatic ecosystems by preventing the periodic flooding of adjacent wetlands, speeding water flow, and replacing irregular streamside habitat with a hardened bank. Channelization of lower Divide Creek would have adverse impacts on the aquatic and wetland ecosystems associated with this drainage and to the biodiversity in this area because aquatic resources would be destroyed or displaced.

West Side Discovery Center and Museum — Impacts on the biological diversity of the park and the surrounding area would depend upon the location of the facility and the magnitude of the disturbance. Location of the facility along Highway 2 near the park could impact the migration of species between park and adjacent wildlands.

Conclusion. Implementation of any one or all of these additional alternatives would not result in the elimination of any plant or animal species from the park. There would, however, continue to be impacts on individual species and on some of the biological communities. Some of these impacts could weaken biological diversity by damaging community integrity and habitat use, by preventing species numbers from naturally expanding, or by interfering with genetic interchange.

Cumulative Impacts. Regional threats to biological diversity would result from habitat fragmentation and degradation of important winter range areas outside the park on the east and south sides as these areas continue to be developed for residential and commercial use and by plowing park roads (particularly on the east side) in or near wildlife wintering areas.

IMPACTS ON THE CULTURAL ENVIRONMENT

Impacts on Cultural Resources

Impact Analysis.

Visitor Use on the Going-to-the-Sun Road — The Going-to-the-Sun Road is a national historic landmark. The expansion of the Logan Pass parking lot would be designed to avoid impacts on any of the features that contribute to the significance of the road. The parking lot area is not historic in surface, size, shape, or appearance. There are archeological resources in the Logan Pass area, which would be avoided or the effects of construction mitigated. Consultation with American Indian tribes would ensure protection of the resources that they deem culturally significant in this area.

The Going-to-the-Sun Road has 15 features that have been identified along its length that define its historic character and that could be adversely affected by development or modification of the road. These features are: the road, Sprague

Creek culvert, Snyder Creek culvert, the horse trail underpass (west), Avalanche Creek bridge, Logan Creek bridge, the west side tunnel, Granite Creek culvert, Haystack Creek culvert, Triple Arches, east side tunnel, Siyeh Creek culvert, Baring Creek bridge, St. Mary River bridge, and Divide Creek bridge. Modification of existing and construction of new pullouts and visitor use areas along Going-to-the-Sun Road and the expanded transportation system would directly impact cultural resource values, but that effect could be mitigated through good design. A pullout at Sunrift Gorge might allow the national register site nearby to be interpreted. Indirectly, these facilities would increase the visitor parking capacity, which would increase wear and maintenance needs.

A patrol cabin near Sunrift Gorge has been listed on the National Register of Historic Places. Development in the area would increase the danger of vandalism.

Careful review during design would allow avoidance of all known archeological resources near parking lots, trails, the discovery center and museum, and road reconstruction areas.

Preservation of the Going-to-the-Sun Road — (4-6 years) This alternative would offer the best preservation of the cultural resources of the Going-to-the-Sun Road because the reconstruction work would be done in the least amount of time, and expected structural failures would be minimized.

The 10± year timeframe would address the most serious structural retaining wall problems before the walls fail. Such failure would cause a loss of cultural resources, additional expense, and major disruption of visitor use. Timely reconstruction would result in preservation of the cultural resource values of the road.

There would be a risk that untried construction techniques such as prefabrication of stone wall segments offsite and construction of avalanche-resistant guard-walls would not work as well as is expected, and there could be delays. The 10±-year timeframe would not provide for the degree of experimentation and testing of prototype designs that a 50-year construction period would allow.

Scenic Air Tours — The tours would not affect cultural resources because the aircraft do not land in the park. However, American Indian cultural activities could be disturbed and adversely affected by noise and visual intrusions.

Winter Use — Winter use of historic buildings would not affect historic buildings adversely and could benefit them because a constant temperature would be maintained. Modifications of the buildings to allow for winter use, such as the addition of insulation, would be done in accordance with the “Secretary of the Interior’s” Standards and Guidelines for the Treatment of Historic Properties.

Divide Creek Flood Hazard — There would be no effects on cultural resources.

West Side Discovery Center and Museum — There would be no effects on cultural resources.

Conclusion. Impacts on cultural resources in the Logan Pass area could be avoided through careful design and review. No cultural resources would be adversely affected by any of the other actions.

Cumulative Impacts. There would be no cumulative impacts on cultural resources as a result of any of these actions. Regular consultation with the

Blackfeet Tribal Business Council and the Flathead Cultural Protection Office would ensure that they would not be adversely affected by any of the alternatives. American Indian cultural use of areas in the park could be adversely affected by noise from scenic air tours.

IMPACTS ON THE SOCIOECONOMIC ENVIRONMENT

Impacts on Regional and Local Economies

Impact Analysis

Visitor Use on the Going-to-the-Sun Road — Expanding the parking lot would benefit the local economy because the construction project would create jobs and generate income. A definitive cost estimate is not yet available, but expanding the parking lot is not anticipated to be a major contribution to the local economy. However, during construction of the parking lot, Logan Pass would be closed, which would adversely affect the local and regional economies. Visitors have indicated that they would be less likely to visit the park if the pass were closed. This would be a short-term effect.

The positive economic benefits to the local and regional economies would continue. Visitor expenditures and expenditures for rehabilitation and maintenance of the road would also continue. Expansion of opportunities along the Going-to-the-Sun Road would probably have a positive economic benefit. Improving the public transportation system would also be expected to have a positive economic benefit.

Preservation of the Going-to-the-Sun Road — (4-6 years) The reconstruction of the Going-to-the-Sun Road would require closure of half of the road for a time. A loss in visitor spending throughout the state would result during construction, but there would be a contribution to the local and regional economies associated with the construction spending.

According to a study conducted by Bioeconomics, Inc., in 1997, it is estimated that park visitation would be reduced by 20 percent each year throughout the 4-6 year reconstruction period, which would be a reduction of 1.5 million visitors distributed over the 4-year construction period. This is slightly more than the largest annual decrease in park visitation in the last 10 years, which was 18 percent and was recorded in 1985.

Construction costs, estimated at \$70 million, are the lowest of any of the alternatives considered, well below the \$100 million estimated for the accelerated construction alternative and the \$150 million for the no-action alternative. It is less expensive to use larger contracts, and the absence of visitors in the construction zone would decrease the cost of reconstruction because contractors would not have to manage traffic while working on the road.

This alternative would have less negative overall effects on the economy of the state of Montana than the 10±-year reconstruction alternative. Reductions in visitor expenditures and the income of business owners, including the Blackfeet tribe,

would total \$48 million over the 4-year period. Montana contractors would have the opportunity to compete for approximately \$70 million in road reconstruction contracts.

It is expected that the 20 percent reduction in overall visitation to Glacier National Park would have an adverse effect on businesses in the gateway communities, but by delaying construction until 2006, time would be provided for local businesses to plan for the reduction. Gateway communities would be adversely affected during the time that the road was closed on the side where they operate. After the road opened, business would resume and could increase while the other side was closed.

(10± years) Since cross-park traffic would continue on a somewhat restricted basis, visitor spending would continue and local businesses would continue to benefit. Only a negligible change would be expected to the local and regional economies and would be substantially offset by the beneficial impacts associated with the construction project for the road.

Throughout the 10± year reconstruction period, it is estimated that visitation to the park would be reduced by an average of 12 percent each year. This amounts to a reduction of 1.8 million visitors over the 10±-year period with slightly larger reductions in the years when sections of the road would be closed completely. The 12 percent average reduction in use under this alternative is well within the 9 percent positive to 19 percent negative range in fluctuation of Glacier's visitation due to other factors such as weather, fees, and previous road reconstruction projects over the past 10 years.

Based on *Estimated Economic Impacts of the Going-to-the-Sun Road Closure and Reconstruction* (Duffield 1997) there would be negative and positive impacts on the economy of the state of Montana. There would be reductions in visitor expenditures to varying degrees for each of the eight years that the Going-to-the-Sun Road was under construction. This could be offset by support services (housing, food) required by the construction labor force. Visitor expenditures and personal income in the state would be reduced by \$51.5 million over the reconstruction period. Montana contractors would have the opportunity to compete for approximately \$100 million in road reconstruction contracts.

It is expected that the anticipated 12 percent reduction in annual visitation to Glacier National Park would have a disproportionately negative effect on businesses in the gateway communities.

By spreading the construction out over a longer period of time, less money would be invested during any particular year. Consequently, events such as unusually heavy snow, floods, and particularly rainy summers would have less of an effect on the overall reconstruction program. Because of the longer time frame the probability of scheduling conflicts (one portion not being finished causing a delay in a subsequent portion) would be reduced.

This alternative would cost approximately \$31 million more than the preferred alternative. This would be due largely to the expense of accommodating visitor traffic through the construction zones during the primary visitor use season, when most of the construction activity would have to take place. There would also

be cost increases during the four additional years that it would take to accomplish the work, or double the amount of time. Visitor use would be disrupted, but the disruption would be limited to short-term daytime closures for critical construction operations during the primary visitor use periods. Closure of the road at night and during spring and fall would impact fewer visitors because use of the road at night in the shoulder seasons is lower than summer day time use.

Scenic Air Tours — The economic impact of a regulated scenic air tour industry is difficult to predict and would depend largely on the effects that regulations had on industry growth. The anticipated impact would be similar to the impacts expected under the no-action alternative. There could be some loss in industrial output if regulation constrained industry growth.

Winter Use — This alternative would generate additional visitor spending and the construction spending necessary to convert the lodges for winter use. Bioeconomics, Inc., recognized a potential negative impact of accommodating winter use in Glacier National Park. They suggested that a shift away from out-of-park hotels to inside the park lodging would negatively impact some individual hotels outside the park. Traditional winter occupancy rates in the region are approximately 33 percent. Bioeconomics, Inc., suggests that the rate could be higher in the park, just as summer occupancy rates are higher in the park than they are outside.

Divide Creek Flood Hazard — The cost of channelizing Divide Creek has been estimated at \$800,000-\$6 million depending upon the design solution chosen. The construction project would contribute to the local and regional economy to a minor degree. An estimate of income and employment is not available for the channelization alternative.

West Side Discovery Center and Museum — The economic impact of constructing outside the park would be the same as constructing in the park in terms of the economic contribution to the local and regional economies. The estimated cost of constructing outside would be \$1.9 million. The model run by Bioeconomics Inc. suggested that an increased industrial output of \$3.06 million, a personal income increase of \$1.54 million, and an employment increase of 61 jobs would result from the discovery center project. Businesses in Apgar could be adversely affected if the visitor contact station were closed and the discovery center and museum were opened outside the park.

Conclusion. The contribution that Glacier National Park makes to the local and regional economies would continue with temporary disruptions during construction of an expanded Logan Pass parking lot. Visitor spending would remain substantially unchanged and the construction projects would benefit employment and income levels of northwestern Montana over time.

Cumulative Impacts. There would be no cumulative impacts.

Impacts on Local and National Visitors

Impact Analysis.

Visitor Use on the Going-to-the-Sun Road — The expansion of the Logan Pass parking area would accommodate more visitors using private vehicles and allow more visitors to experience this feature of Glacier National Park. Logan Pass is a destination for both local and national visitors. Adding more parking spaces would serve visitor needs until visitation increased to overflow the available spaces as has happened over time since the original construction. More crowding at the current facilities and on the trails in the area might be an indirect effect. During construction visitors would be temporarily adversely affected because they would not be able to stop at Logan Pass.

The expanded and improved transportation system would enhance visitor use for those who would like to experience Glacier National Park and the Going-to-the-Sun Road through the use of a shuttle system. If the transportation system provided more parking opportunities along the road, visitors in private vehicles would have an improved experience. Expanding opportunities along the corridor would enhance use, provide access to different resources, and improve appreciation for the park's various attractions.

Preservation of the Going-to-the-Sun Road — A 4-6-year construction period would have a positive effect on local and national visitors in the long term. During the reconstruction period, visitors on both sides of the park would be temporarily adversely affected; however, they would not be affected at the same time. The reconstruction period would be of short duration, limiting the time visitors would be adversely affected.

This alternative would have the positive effect of getting the reconstruction work done in the shortest amount of time. Visitor use would be disrupted for a total of only 4-6 years, but during that time travelers would not be able to go from one side of the park to the other on the Going-to-the-Sun Road. Logan Pass Visitor Center would remain open. The most likely closure points would be at the Avalanche and Rising Sun developed areas. This would disrupt the sightseeing and trail access that is normally available at these points.

Delays in cross-park travel, one-way traffic, and other possible means of control necessary during reconstruction of the road would inconvenience visitors to Glacier during the project. The impact would be worse for the national visitor than the local visitor because more detailed knowledge of construction activity would allow local visitors to adjust their travel patterns. This effect would be mitigated by increased information and communication with the visiting public outside the area.

(10± years) This alternative would keep the entire critical alpine section of the Going-to-the-Sun Road open to the public for the primary visitor use season throughout the time that the road would be under construction. The Logan Pass area would be open throughout the reconstruction period. There would be traffic delays and inconvenience associated with one-way use of the road, closures at

night, and closures during spring and fall. But the closures would be relatively short and would not affect large numbers of visitors since use is low during these times. The road could continue to be used as a way to get from one point in the park to another. However, use of the 10-mile section during construction would be limited to driving through a construction zone, use of the Logan Pass visitor center, or access to designated trailheads.

This alternative would cost about \$31 million more than the preferred alternative because of the expense of accommodating visitor traffic and cost increases during the additional years that it would take to accomplish the work. This alternative would double the time of disruption; however, the disruption would be limited to short-term daytime closures for critical construction operations. The road would be closed only at night and during spring and fall when not as many visitors would be affected.

Scenic Air Tours — Regulating scenic air tours would improve the backcountry experience of many visitors. By controlling flight locations and elevations, backcountry experiences in the North Fork, Middle Fork, Two Medicine, Goat Haunt, and Belly River areas would not be adversely impacted by mechanized sounds and visual intrusions. At the same time a regulated industry would continue to provide an experience for those visitors who prefer to fly over the park.

Winter Use — Accommodating increased day and overnight use, including lodging, would provide a visitor experience that is not now available. By providing winterized accommodations, plowed roads, and campstores, a new visitor experience would be available (see preferred alternative for other impacts).

Divide Creek Flood Hazard — Channelizing Divide Creek would have a positive effect on visitor use because road closure due to flooding would be less likely and better protection would be provided for facilities and visitors.

West Side Discovery Center and Museum — An adequate discovery center on the west side of the park would enhance information services, interpretation, and orientation. The west side discovery center would provide information about traffic congestion and might allow for better distribution of travelers to other areas of Glacier.

Conclusion. Providing overnight accommodations and enhancing access for day users would increase the range of experiences available for park visitors in the winter. More parking at Logan Pass would accommodate more private vehicles, which could lead to more crowding in the surrounding area. Visitors would be temporarily adversely affected during construction of the larger Logan Pass parking lot.

Cumulative Impacts. Regulation of scenic air tours would improve visitor experiences in the North Fork, Middle Fork, Two Medicine, Goat Haunt, and Belly River areas. Channelizing Divide Creek could have a beneficial effect on visitors in the St. Mary area.

Impacts on Energy Consumption

Impact Analysis.

Visitor Use on the Going-to-the-Sun Road — Beyond the energy necessary to construct the expanded parking lot, no increase is anticipated in energy consumption. The Going-to-the-Sun Road would continue to offer the road corridor as the primary visitor attraction of Glacier National Park. There would be no significant change in energy consumption. The improved transportation system might reduce use of private vehicles, which would reduce consumption.

Preservation of the Going-to-the-Sun Road — (4-6 years) Reconstruction of the Going-to-the-Sun Road would increase consumption of energy temporarily during the reconstruction period because traffic would be rerouted to Routes 2, 49, and 89, which would increase the distance traveled.

(10 ± years) Traffic delays would result in increased energy consumption because vehicles would spend additional time idling during the delays.

Preservation of Historic Hotels and Visitor Services — The rehabilitation of the lodges would incorporate many energy conserving technologies and would result in a net reduction in energy consumption in the park.

Traffic delays would result in increased energy consumption because vehicles would spend additional time idling during the delays.

Scenic Air Tours — Allowing scenic air tours over some parts of the park and not others would not change the energy use in Glacier National Park.

Winter Use — The expansion in winter use would result in more visitors and a modest increase in energy consumption. The numbers of visitors attracted are expected to be small (Bioeconomics Inc.). The addition of overnight accommodations would increase consumption. However, the lodges open for use would be winterized and would incorporate energy saving technologies. This action would result in an overall increase in consumption.

Divide Creek Flood Hazard — There would be no impact on energy consumption beyond the energy needs of the channelization project itself and annual maintenance.

West Side Discovery Center and Museum — Air conditioned and heated spaces would increase energy consumption modestly. Energy saving technologies would be incorporated into the design.

Conclusion. For the most part no impact on energy consumption would result from implementation of the above actions. Winter use would increase energy use, but new energy saving technologies would be employed to limit the increase.

Cumulative Impacts. No cumulative impact on energy consumption of any magnitude would result.

Impacts on Environmental Justice

Impact Analysis. None of the actions would adversely affect environmental justice because no actions would affect minority populations disproportionately. The alternatives would not disproportionately adversely affect minority or low income populations because the actions recommended would affect all populations equally.

Conclusion. There would be no effects on minority or low income populations.

Cumulative Impacts. There would be no cumulative impacts.

Impacts on Owners of Land in the Park and Adjacent to the Boundary

Impact Analysis.

Visitor Use on the Going-to-the-Sun Road — Owners of land in the park or adjacent to the boundary would not be adversely affected by development of new pullouts, trails, and picnic areas, an expanded transportation system or an expanded Loagn Pass because development would not occur near private land.

Preservation of the Going-to-the-Sun Road — (4-6 years) Reconstruction of the Going-to-the-Sun Road could adversely affect landowners by temporarily delaying access to their properties during reconstruction. Although the road reconstruction and closure at Avalanche is past any private property in the park, landowners could be temporarily delayed by construction equipment and increased congestion. The effects would be temporary and would last only until reconstruction was complete.

(10± years) Reconstruction of the Going-to-the-Sun Road could adversely affect landowners by temporarily delaying access to their property during reconstruction.

Scenic Air Tours — There would be no adverse impacts on landowners. Regulating scenic air tours might improve the experience of some landowners by controlling the mechanized noise and intrusions of scenic air tours. It could increase the amount of scenic air tour activity in the Going-to-the-Sun corridor, increasing the noise levels and disturbance for visitors around Lake McDonald.

Winter Use — Landowners inside the park boundary could be affected by increased winter use of the park, which could increase the risk of vandalism. However, increased visitor activity might also discourage acts of vandalism. Access could become more difficult for landowners who live in the park in the winter due to a change in plowing.

Divide Creek Flood Hazard — There are no private landowners in the park at St. Mary.

West Side Discovery Center and Museum — Landowners in the park would not be adversely affected since the structure would not be constructed in the park. Landowners outside the park would not be adversely affected because if private

land was purchased, the landowner would be a willing seller and would receive market value for the property.

Conclusion. Landowners inside the park would not be adversely affected by any of the above actions. They would benefit from the removal of air tours from the park. Landowners in the vicinity of Lake McDonald would be more affected by scenic air tours if they were restricted to the Going-to-the-Sun corridor. Channelization of Divide Creek would have a positive impact, providing protection of adjacent private property.

Cumulative Impacts. Cumulative adverse impacts on landowners outside the park would occur from increased scenic air tour activity combined with increased development and growth in the areas surrounding the park.