L76-GLAC-00-049

Dear Friends:

Enclosed is Glacier National Park's *Fire Management Plan and Environmental Assessment*. The EA is also available on our website at www.nps.gov/glac.

The National Park Service (NPS) proposed to update the Fire Management Plan for Glacier National Park, Montana. The first plan was released in November 2002. Public meetings were held in Browning and West Glacier in December. After reviewing the public comments, Glacier National Park decided to make some changes in the proposed fire program to clarify our intent and better address impacts to wildlife. These changes resulted in the need to reissue the Fire Management Plan/EA for another 30-day public comment period. Public meetings will not be held again, but if you have questions or concerns that you would like to discuss with park staff, please call Fred Vanhorn at 406-888-7830.

The preferred alternative provides strategies to manage fire, including suppression of unwanted wildland fires, increasing the use of prescribed fire to meet resource objectives and to restore the role of fire as a natural disturbance, and mechanically reduce fuels to enhance our ability to defend structures during a fire.

Please send your comments by mail to Glacier National Park, Attn: Fire Management Plan EA, PO Box 128, West Glacier, MT, 59936. Comments may also be sent electronically to glac_public_comments@nps.gov, attention: Fire Management Plan EA. The public comment period ends April 7, 2003.

Our practice is to make comments, including names and home addresses of respondents, available for public review during regular business hours. Individual respondents may request that we withhold their home address from the record, which we will honor to the extent allowable by law. **If you wish us to withhold your address, you must state this prominently at the beginning of your comment.** We will make all submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, available for public inspection in their entirety.

Sincerely,

/s/ Michael O. Holm

Authenticated by Donna J. Owen 3/6/03

Michael O. Holm
Superintendent

Enclosure

U.S. Department of the Interior

GLACIER NATIONAL PARK
MONTANA

FIRE MANAGEMENT PLAN and Environmental Assessment

March 2003

Fire Management Plan
and
Environmental Assessment

GLACIER NATIONAL PARK

Summary

The National Park Service (NPS) proposes to develop a new Fire Management Plan for Glacier National Park, Montana. The plan would guide the wildland fire program by providing management direction that would support the accomplishment of resource management and protection objectives.

Fuel loadings and tree densities have increased in some areas beyond their range of natural variability. Some park developed areas are now at risk. Stepped-up management intervention is required to reduce fuels that under severe burning conditions could threaten life and property, and to restore the role of fire as a natural disturbance across the Glacier National Park landscape.

The current 1991 plan (with a policy update in 1998) contains objectives that allow for wildland fires in certain areas to be managed for resource benefits, limited prescribed fires to meet resource objectives, and limited manual hazard fuels treatments involving cutting and thinning to establish defensible space around values to be protected. Unwanted wildland fires are suppressed.

The revised Fire Management Plan would provide strategies that include suppression of unwanted wildland fires, expanding opportunities under a multi-year treatment schedule for increasing the use of prescribed fire to meet resource objectives and improve fuel reduction (mechanical fuel reduction and prescribed burning) treatments that would enhance defensibility around structures. This plan would become the park's component of a joint fire management plan with the Flathead National Forest to maximize cooperation and result in better planning and response to fire activity in the area. Where National Forest Service and National Park Service lands share a common boundary, similar fire management objectives will be met through joint operations and shared positions where possible. The environmental assessment only addresses the NPS portion of the plan.

Two alternatives, a no-action and a preferred alternative, were identified based on program goals and objectives; internal and external scoping; guidance from existing park plans; policy guidance from the National Park Service; the 2001 Federal Fire Policy; and the National Fire Plan; and research, monitoring, and experience from Glacier National Park's fire management program.

Alternative A (No Action). Under the current plan, allow wildland fire use and suppression and continue current levels of limited prescribed fire and non-fire treatments to meet objectives.

"Wildland fire use" (formerly called "prescribed natural fire") refers to the management of naturally ignited wildland fires to accomplish specific, prestated objectives in predefined geographic areas outlined in the Fire Management Plan. Under the current plan, the park has begun to reduce fuel buildup and in some areas has approximated natural fire regimes, but not to the level needed for comprehensive ecosystem restoration and maintenance or to meet protection objectives. In addition, the current program does not satisfy the new requirements of the National Fire Plan and the 2001 Federal Wildland Fire Management Policy.

Alternative B (NPS Preferred). Implement a revised Fire Management Plan that allows for wildland fire use and suppression and increased use of prescribed fire and increased non-fire treatments to meet objectives.

Four changes from the 1991 plan are proposed.

- *Update policy and terminology to achieve federal and agency compliance*

- *Revise fire management units and their descriptions of proposed strategies*

  The proposed Fire Management Unit (FMU) boundaries would allow for changes if management objectives change in specific areas or if natural fires change the baseline conditions. Because of direction from the National Fire Plan and current resource management objectives for Glacier National Park, three FMUs are proposed. The Wilderness/Resource Benefits FMU contains proposed wilderness; wildland fire use is the primary strategy. The Mixed Values FMU includes remote locations as well as urban/wildland intermix areas; wildland fire use is an option, but prescriptions are more restrictive because of values to be protected. The Developed Area FMU contains areas of urban/wildland intermix; fire starts would typically be suppressed. The use of prescribed fire and mechanical fuel reduction treatments will be emphasized in this unit.

- *Increase the use of prescribed fire under a multi-year treatment schedule*

  Depending on conditions, the park would treat an average of 100 to 500 acres per year to meet ecological and hazard fuels reduction objectives. As work progresses, the schedule would be revised to build on past accomplishments.

- *Increase the scope of non-fire treatments to meet resource and protection objectives*

  Manual fuel reduction strategies would be used as needed in the wildland/urban interface areas, and in combination with prescribed fire for debris disposal. Priority areas planned for manual treatments and debris disposal/low-intensity fuel reduction burns over a multi-year treatment schedule include Apgar, Cut Bank, Glacier Park Headquarters Compound, Many Glacier/Swiftcurrent, Rising Sun, Saint Mary, Two Medicine, and Upper Lake McDonald (Ranger Station and Lodge).

The NPS preferred alternative would have no impacts on environmental justice, floodplains, geology and topography, prime and unique farmland, socioeconomics, or wild and scenic rivers. There would be negligible to moderate, long-term beneficial effects on vegetation and wildlife; the proposed action may affect but is not likely to adversely affect federally listed threatened and endangered species and state listed species of concern. The preferred alternative would have short-term minor adverse but long-term minor to moderate beneficial effects on soils, water and aquatic resources, wetlands, and wilderness values. There would be short-term negligible to moderate adverse effects, but long-term minor to moderate beneficial effects to air quality, cultural and ethnographic resources, aesthetics and recreational values, park operations and park neighbors as hazard fuels are managed and fire is restored as a natural disturbance on a landscape scale in the long-term. There would be short-term, localized, minor adverse effects to the natural soundscape during mechanical fuel reduction activities.

NOTE TO REVIEWERS AND RESPONDENTS

This environmental assessment is available on the Glacier National Park Internet Web site at http://www.nps.gov/glac/ and is being distributed for public and agency review and comment for a period of 30 days in accordance with the National Environmental Policy Act. If you wish to comment on the environmental assessment, you may mail comments to the name and address below, or e-mail them to: glac_public_comments@nps.gov by April 7, 2003. Our practice is to make comments, including names and home addresses of respondents, available for public review during regular business hours. Individual respondents may request that we withhold their home address from the record, which we will honor to the extent allowable by law. **If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment.** We will make all submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, available for public inspection in their entirety.

Please send comments by April 7, 2003 to:

Superintendent
Attn: Fire Management Plan/EA
Glacier National Park
West Glacier, MT 59936

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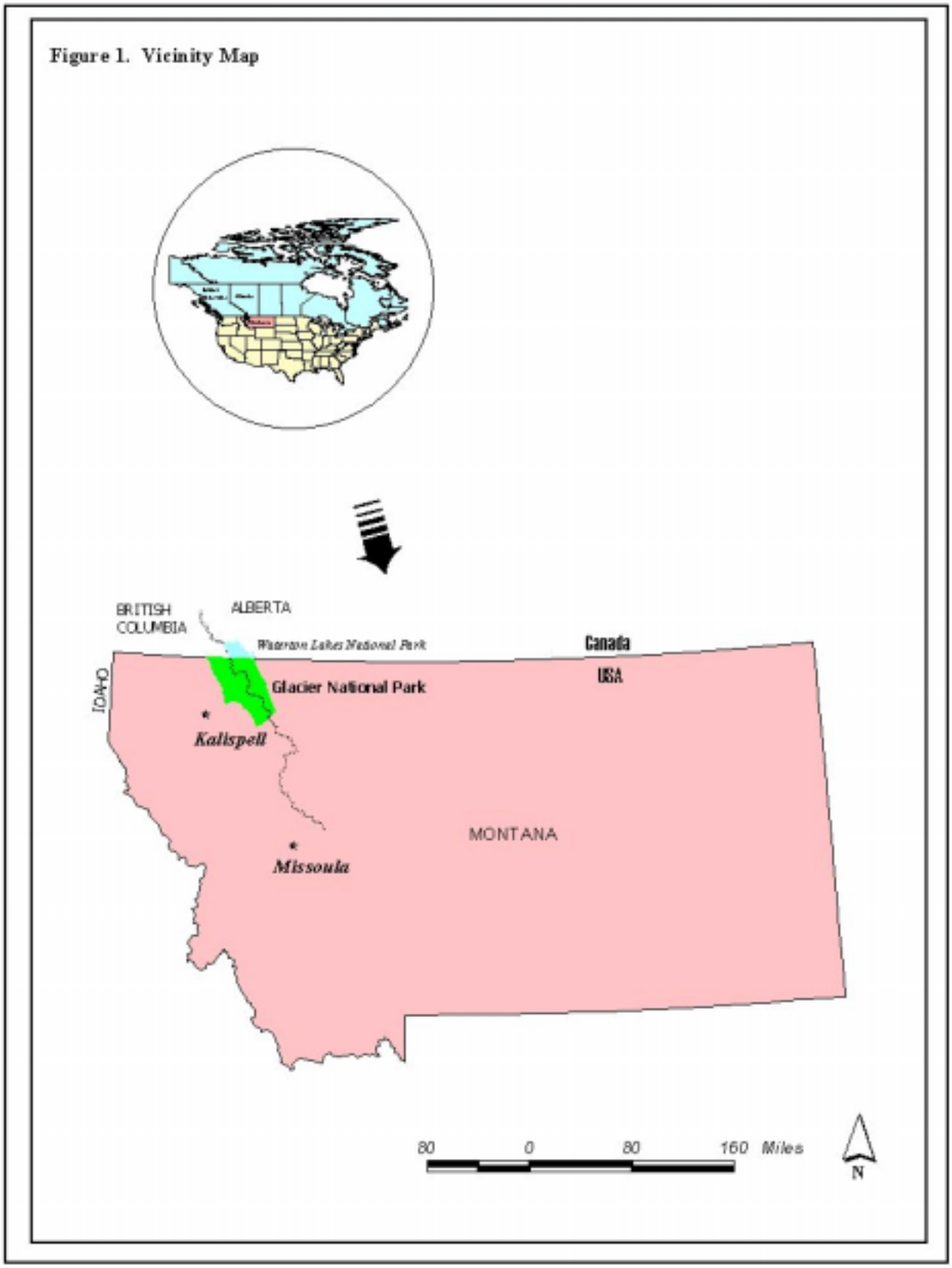


Figure 1. Vicinity map.

INTRODUCTION

Purpose and Need for Federal Action

The 1,013,595 acres comprising Glacier National Park in northwest Montana are of worldwide significance. Established in 1910, Glacier was set aside "as a public park or pleasure ground for the benefit of the people of the United States" (enabling legislation for Glacier National Park). The wide variations in climate, elevation, geology, and soils help define four geographic vegetation patterns. Glacier provides habitat for natural populations of indigenous carnivores and most of their prey species and nearly all species of terrestrial wildlife present when the park was established. The long and varied human history of the region also is reflected in the park's cultural resources, which include historic buildings and structures, archaeological sites, and ethnographic landscapes. Glacier also serves the spiritual needs of native peoples of the area.

Glacier National Park and Waterton Lakes National Park of Canada are designated the world's first International Peace Park. Waterton-Glacier International Peace Park also has been designated an International Biosphere Reserve and a World Heritage Site. Ninety-five percent of Glacier National Park is proposed wilderness, and following NPS policy, is managed as designated wilderness.

The park continues to recognize the role that fire plays in a balanced natural resource management program. Accordingly, the purpose of this federal action, under the authority of Director's Order 18,[1] is to prepare and implement an updated long-range Wildland Fire Management Plan. The Fire Management Plan would provide direction to a program that uses the benefits of fire to achieve desired resource conditions while protecting park resources and those of adjoining lands into the future. Further, this plan implements the Glacier National Park Resource Management Plan (1993), replaces the current Fire Management Plan (1991), updates existing goals and objectives, and redefines strategies and actions to accomplish them under the general guidance provided by the park's General Management Plan (NPS 1999a).

This assessment was prepared in accordance with the National Environmental Policy Act (1969) and will evaluate the potential impacts of a range of fire management program strategies under a new plan on a variety of impact topic areas. It is also intended to facilitate sound decision-making based on the current and best understanding of direct and indirect, short- term and long-term, and cumulative consequences of the proposal to thereby determine whether an environmental impact statement is required.

The need for a new Fire Management Plan is based not only on policy but also on scientific study and monitoring that are contributing to a growing understanding of successional trends in the park.

Ninety percent of the natural fire starts in the park occur west of the continental divide (NPS files). Ninety-eight percent of Glacier's 1910–1968 fires occurred between June 19 and

[1]Effective November 17, 1998, the objective of RM-18 is to institutionalize within the NPS the new policies, organizational and operational relationships, and changes in law and reporting requirements and to direct that all parks with vegetation capable of burning will prepare a Fire Management Plan that is responsive to the park's natural and cultural resource objectives and safety of park visitors, employees, and developed facilities.

September 19, and 95% of these fires occurred at elevations below 7,100 ft (2165 m). About two-thirds of the fires occurred on south-facing slopes (O'Brien 1969).

Large fires on record include the following locations, with acres burned inside park boundaries:

- 1910 – Large fires throughout Montana, North Fork area, Firebrand Pass (47,900 acres)
- 1926 – Large fires in North and Middle Fork area (10,500 acres)
- 1929 – Halfmoon Fire burned in Apgar/Middle Fork area (34,400 acres)
- 1936 – Heavens Peak Fire burned over Swiftcurrent Pass (14,142 acres)
- 1967 – Huckleberry and Glacier Wall Fires (6300 acres)
- 1984 – Napi Point and Crystal Fires (6500 acres)
- 1988 – Red Bench Fire (22,000 acres in park)
- 1994 – Howling, Anaconda, Adair, and Starvation Fires (16,465 acres)
- 1998 – Kootenai Complex, North Fork Complex (9411 acres)
- 1999 – Anaconda Fire (10,800 acres)
- 2000 – Parke Peak, Sharon (2742 acres)
- 2001 – Moose Fire (24,000+ acres in park)

Fire history data suggest a declining fire frequency as suppression policies interrupted natural fire cycles, altered vegetative communities, and increased the acreages of wildfires since 1910 (Barrett 1997). The forest composition has become less diverse from an age, spatial and species composition standpoint. Fire suppression results in reduced forest vigor due to increased windfall, and damage from insect pests such as Mountain pine beetle (*Dendroctonus ponderosae*), and fungal infestations such as root rot (e.g., *Fomes spp.*) and blister rust (*Chronartium ribicola)*. Excluding fire from the landscape concurrent with heavy mortality and a rapidly declining seed source in the whitebark pine type increases the threat to the continued existence of the species. Whitebark pine is a keystone species of the upper subalpine ecosystem by protecting watersheds, promoting post-fire forest regeneration and providing a valuable food source for wildlife (Tomback et al. 2001).

Mixed-severity natural fires, which include a range of fire sizes and intensities, serve to maintain a diversity of species and age-classes, open meadows, and wildlife habitats, and to moderate fuel loads. Lack of natural fire due to suppression decreases habitat diversity and promotes unnaturally dense fuel loads, resulting in unnaturally high intensity fires.

A recent example is the Anaconda Fire. In 1999 the park managed the Anaconda Fire for resource benefits and significantly reduced the fuel loading and fire danger over 10,000 acres. In 2001 the Moose wildfire burned into the park in the same general area, but was unable to carry within the Anaconda fire perimeter due to the reduced fuel loads and the resultant mixed vegetation mosaic. If park management had suppressed the Anaconda Fire, the Moose Fire undoubtedly would have burned a much larger area, produced much larger volumes of smoke, and likely would have burned much more severely with more intensity possibly damaging watershed, soils, wetlands and other values.

Goals and Objectives for the Glacier National Park Fire Management Plan

The Fire Management Plan for Glacier National Park was developed cooperatively with the Flathead National Forest, with the following joint goals:

- To guide a joint agency decision-making process where safety, social, political, and resource values are evaluated; and appropriate management response strategies are identified for wildland fires in all Fire Management Units, including an appropriate suppression response strategy for all unwanted wildland fires.
- To provide a framework for hazard fuels management strategies and for restoring wildland fire to fire-dependent ecosystems.
- To provide an interagency platform from which to cooperate more fully in planning and implementing a wildland fire program across agency boundaries.

The following goals also guide the fire management program for Glacier National Park:

Goal 1: Make firefighter and public safety the highest priority of every fire management activity.

Fire Management Objective: Ensure that wildland fire and prescribed fire operations cause no lost time or major injuries to either the public or firefighters.

Goal 2: Restore fire to its natural role in the park to the maximum extent possible to enable natural processes to function essentially unimpaired by human influence.

Fire Management Objective: Use prescribed fire and wildland fire for resource benefit as tools to meet resource management objectives and to maintain and restore, where possible, natural resources and natural ecological conditions; and foster support for the program with public information and education.

Goal 3: Suppress all wildfires regardless of ignition source.

Fire Management Objective: Limit 95% of unwanted wildland fires to less than 10 acres in size.

Goal 4: Manage wildland fires so that resource (natural, cultural, and improvements) damage is minimized by fire suppression actions.

Fire Management Objective: Keep cost of rehabilitation below 10% of total suppression costs.

Goal 5: Facilitate reciprocal fire management activities through cooperative agreements and working relationships with other fire management entities.

Fire Management Objective: Improve and continue to maintain relationships with neighboring agencies through frequent communication, completion of mutually beneficial projects that extend beyond political boundaries, sharing resources and educational opportunities and otherwise engaging in cooperative efforts.

Goal 6: Manage prescribed and natural fires managed as prescribed fires in concert with federal and state air quality regulations.

Fire Management Objective: Work with MDEQ to ensure that GNP complies with National Ambient Air Quality Standards to the greatest extent possible given wildland fire use situations.

Goal 7: Reduce wildland fire hazards around developed areas and in areas adjacent to cultural sites.

Fire Management Objective: Use strategies to reduce risk of fire destroying or damaging cultural or historic sites, or any public or private structure.

Goal 8: Prevent the incidence and extent of unplanned, unauthorized, human-caused ignitions.

Fire Management Objective: Prevent unplanned, unauthorized, human-caused ignitions through fire prevention and education programs for park visitors, neighbors, and staff.

Issues

The following issues were identified during scoping and are considered in this EA.

1. Wildland fire and prescribed fire activities within the park may have potential to affect cultural and/or historic resources.
2. British Columbia commercial forest interests may be adversely affected by wildland fires originating from the park along those portions of the international boundary.
3. There may be potential impacts to park native biota from changes in the distribution and/or composition of exotic species affected by wildland fire use.
4. Wildland fires starting on the east side of the park (east of the Continental Divide) may have potential to cross the park boundary onto the Blackfeet Indian Reservation.
5. Managers should focus efforts in Middle Fork area and East Side areas.
6. If proper fuel reduction around private land/residences and federal buildings is not done before a fire, political pressure may require bulldozers, lines, etc., to protect property and cause more resource damage than would be caused by performing fuel reduction ahead of time.
7. Glacier managers should try to reach some agreement with tribal and private landowners on the East Side to conduct prescribed burns.
8. Need to treat the "landscape" and manage for fire, not do checkerboard management according to land ownership.
9. Need to do big 5000+ acre projects, not 5- to 10-acre ones. The 5- to 10-acre fires are not large enough to be effective.
10. How will problem of fuel buildup in suppression zones be dealt with?
11. How will use of retardant, tree and shrub cutting, and construction of firelines be mitigated?

Impact Topics

Impact topics are resources that could be affected by the range of alternatives. Specific impact topics were developed to ensure that alternatives were compared on the basis of the most relevant topics. The following impact topics were identified on the basis of federal laws, regulations, orders, and National Park Service *Management Policies, 2001*. An annotated listing of applicable federal laws, executive orders, and federal policies is found in Appendix F.

Air Quality. The purpose of the Clean Air Act and Amendments of 1977 and 1990 is to prevent and control air pollution, and prevent major deterioration of areas where air is cleaner than National Ambient Air Quality Standards. Because activities under both alternatives would impact air quality related values in and around Glacier National Park, air quality is addressed as an impact topic.

Natural Soundscapes. The proposed activities include use of equipment that would generate noise, which could impact the natural soundscape. Therefore, natural soundscapes are addressed as an impact topic.

Threatened and Endangered Species and Species of Concern. Because activities connected with both alternatives would affect federally listed species and state listed species of concern, they will be addressed as an impact topic in this environmental assessment.

Soils. According to National Park Service Management Policies 2001, the Service will strive to understand and preserve the soil resources of park units and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources. Because actions discussed under the alternatives would impact soils in the park, soils are addressed as an impact topic.

Vegetation. Because activities under both alternatives would impact vegetative communities in and around Glacier National Park, vegetation, including exotic species, is addressed as an impact topic.

Water and Aquatic Resources. Because actions under the alternatives would impact water and aquatic resources at Glacier National Park, water and aquatic resources are addressed as an impact topic.

Wetlands. Executive Order 11990 provides for the protection of wetlands. Because some of the activities included in the alternatives would impact wetlands in the park, wetlands are addressed as an impact topic.

Wilderness. National Park Service Management Policies (Section 6.3.9) states "...fire management activities conducted in wilderness areas will conform to the basic purposes of wilderness..." Because some wildland fire activities in the park backcountry would impact wilderness values, wilderness is addressed as an impact topic.

Wildlife. Because the alternatives would impact wildlife and habitats at Glacier National Park, wildlife is addressed as an impact topic.

Aesthetics and Recreational Values. Because aesthetics and recreational values would be impacted by fire management operations, they are addressed as an impact topic.

Cultural Resources. The National Historic Preservation Act, as amended in 1992 (16 USC 470 *et seq*.); the National Environmental Policy Act of 1969 (42 USC 4321 *et seq*.); and the National Park Service's Director's Order #28, *Cultural Resource Management Guideline (1997*), *Management Policies, 2001* (2000), and Director's Order #12, *Conservation Planning, Environmental Impact Analysis, and Decision Making* (2001) require the consideration of impacts on historic structures listed in or eligible for listing in the National Register of Historic Places. Because wildland fire management activities could impact cultural resources in the park, cultural resources are addressed as an impact topic

Ethnographic Resources. Because fire management actions would impact ethnographic resources, they are addressed as an impact topic.

Park Operations. Because park operations would be affected by fire management actions in the park, they are addressed as an impact topic.

Park Neighbors. Because fire management activities along park boundaries would impact park neighbors, they are addressed as an impact topic.

Issues and Impact Topics Considered but Not Further Addressed

The following issues and impact topics were considered during initial scoping but are not addressed further in this assessment

Park-wide portable communications systems must be upgraded. Although operationally important to park operations and safety, this issue is beyond the scope of this document and therefore was dismissed.

How would salvage logging in the National Forest after fires last summer (2001) affect fire in the park in the future? Although this may be an issue from park neighbors standpoint, it is viewed as outside the scope of park jurisdiction. Therefore, this issue was dismissed from detailed analysis.

Environmental Justice. The National Environmental Protection Act (NEPA) requires analysis of impacts to the human environment in the affected area. Under the alternatives, the preferred action and no action, there would not be a disproportionate affect on minority or low-income populations resulting from fire management activities in the park. The wildland fire management program would have an equal affect on all populations. Therefore, environmental justice was dismissed as an impact topic from further analysis.

Floodplains. Many park developed areas, which were built before Executive Order 11988-*Floodplain Management*, are located within floodplains or have not had formal designation of the boundaries. Divide Creek is a known flood hazard zone where St. Mary's administrative facilities and employee housing are located. Because floodplains would be unaffected by the proposed action, floodplains was dismissed as an impact topic. A Statement of Findings for floodplains will not be prepared.

Geology/Topography. Because there would be no impacts to geological features and the topography of the ground would be unchanged, geology and topography were dismissed as impact topics.

National Wild and Scenic Rivers System. In 1976, Congress designated the three forks of the Flathead River as part of the National Wild and Scenic Rivers System. The North Fork is designated "scenic" from the international boundary downstream to Camas Creek and "recreational" to the confluence with the Middle Fork. The Middle Fork is designnated "recreational" for its entire length bordering the park. Although designation of the North and Middle Forks helps to protect natural, cultural, scenic, and recreational values of the park in a broader regional setting, there are no planned management actions under either alternative in or near these rivers that would impact on such designation.

Prime/Unique Farmlands. In August, 1980, the Council on Environmental Quality (CEQ) directed that federal agencies must assess the effects of their actions on farmland soils classified by the U.S. Department of Agriculture's Natural Resource Conservation Service as prime or unique. Prime or unique farmland is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. There are no prime and unique farmlands as defined by the Natural Resource Conservation Service inside Glacier National Park boundaries; therefore, prime/unique farmlands were dismissed as a topic.

Socioeconomics. The proposed project would provide employment opportunity for only a few individuals for a short time period. Therefore effects, if any, would be negligible.

Relationship of the Proposed Action to Other Plans

The proposed action is consistent with goals and objectives stated in the *Final General Management Plan and Environmental Impact Statement* (NPS 1999a), the *Fire Management Plan* (NPS 1991), the *Resource Management Plan* (NPS 1993b), the *Hazard Fuels Management Plan* (GNP 1993), and *Backcountry Facilities Area Plan for Hazard Fuel Removal* (1999) for Glacier National Park. Also, the proposed action is supportive of direction provided in the adjacent *Flathead National Forest Land & Resource Management Plan* and *Waterton Lakes National Park Fire Management Plan.*

The plan would implement fire management policies and help achieve resource management and fire management goals as defined in:

- Federal Wildland Fire Management Policy and Program Review;
- Managing Impacts of Wildfires on Communities and the Environment, and Protecting People and Sustaining Resources in Fire Adapted Ecosystems – A Cohesive Strategy (USDOI/USDA); and
- A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan.

All of these documents are available at http://www.fireplan.gov/report_page.cfm.

ALTERNATIVES

This section presents two alternatives: Alternative A, the no-action alternative, and Alternative B, the NPS-preferred alternative. The strategies described in each have been identified as the most reasonable for meeting park resource and fire management objectives.

Alternative A, the no-action alternative required by the National Environmental Policy Act (NEPA), would continue the *current* fire management program that includes suppression, limited prescribed fire, limited manual treatment to reduce hazardous fuels, and managed wildland fire.

Alternative B, the preferred alternative**,** proposes methods to meet long-term resource management and hazardous fuel reduction objectives contained within a *new Fire Management Plan* for Glacier National Park, and meets requirements of the National Fire Plan and the 2001 Federal Fire Policy. Under the new plan, strategies include suppression, increased use of prescribed fire under a multi-year treatment schedule, increased manual treatment to reduce hazardous fuels, and managed wildland fire.

Strategies Common to All Alternatives

1. Suppression actions would be taken on all unwanted wildland fires, and would provide for public and firefighter safety, protect public and private resources, and use techniques that are least damaging to Glacier's natural and cultural resources. Wildland fires or the use of naturally-ignited fires to benefit resources under specified conditions and locations described in the Fire Management Plan, would be allowed.
2. Manual treatments, including mechanical removal of trees, may be used to reduce hazardous fuel loading
3. Prescribed fire is used to accomplish resource and protection objectives.

Alternative A: No Action

Under the current plan, allow wildland fire use and suppression and continue current levels of limited prescribed fire and non-fire treatments to meet objectives.

Under this alternative, the current Fire Management Plan (NPS 1991) would remain in effect. However, the plan would require some revision to meet terminology changes contained in the federal and NPS wildland fire policies. The 1991 Fire Management Plan was amended on August 10, 1998, to incorporate revised fire terminology and adjusted fire management unit prescriptions. There have been subsequent policy changes as a result of the fires of 2000. All wildland fires (see definition in Appendix A) would be managed by considering resource values to be protected and firefighter safety, using the full range of strategic and tactical operations. All wildland fires not capable of supporting resource management objectives would be suppressed.

Fire Management Units under the Current Fire Management Plan

A "Fire Management Unit" (FMU) is any area defined by common management objectives, land features, access, values to be protected, political boundaries, fuel types, major fire regimes, or special management areas designated by agency authority or congressional action (ie, wilderness), and firefighter safety concerns. There are four units in Glacier National Park described in the 1991 plan.

Wildland fires not meeting the appropriate decision criteria for a specific unit would be suppressed. Decision criteria include distance of the ignition from the unit boundary; the fuels and weather patterns in the area; the time remaining in the fire season during which the fire may potentially spread and exit the park; and the Energy Release Component (ERC) of the National Fire Danger Rating System (NFDRS) at the time of discovery (NPS 1991). The following FMUs (A through D) are listed in order of increased aggressive suppression action as determined by decision criteria.

Unit A – Unit A lies west of the Continental Divide, primarily in high-elevation terrain with light fuels, or in areas surrounded by natural fuel breaks. The unit is centrally located and furthest removed from park boundaries. Fires in this unit tend to spread small distances under normal conditions, generally upslope and up valley following the prevailing westerly winds. The Continental Divide prevents fires from spreading to the east. Only under extreme circumstances in certain areas have fires been known to cross the Divide. Values to be protected in this unit (facilities, cultural resources, etc.) are minimal and managed wildland fire (typically lightning-ignited) would be the primary strategy to meet resource management objectives.

Unit B – Unit B occupies mostly forested terrain west and southwest of Unit A. Fuels are normally heavier and dryer than in Unit A and fires tend to spread upslope and upvalley towards Unit A. Prevailing winds are from the west or southwest, and there is no record of fires leaving the park after starting in this unit. Occasional wind-driven stand replacement fires in this unit have produced large even-aged forests. Values at risk in the unit are minimal, and under certain conditions, wildland fire would be used to achieve resource benefits.

Unit C – Unit C lies west of Unit B continuing to the park boundary in most areas. Fires in this unit generally stay small but under the right fuel and wind conditions, can grow to large

stand replacement fires. Current stands of beetle-killed lodgepole pine could readily support major fires. Due to terrain features and prevailing winds in the area, fires frequently enter the park from adjacent lands but rarely leave the park. Values at risk in this unit are generally minimal but adjacent values, both inside and outside the park, are substantial. Therefore, wildland fire for resource benefit may be allowed when ERC levels are appropriate and other criteria are met. Some limited prescribed fires may be necessary in to reduce fuel loads to a point where managed fire would be safe and appropriate.

Unit D – Unit D consists of the remainder of the park not included in Units A, B, or C. This unit includes the northwest corner of the park, portions of the McDonald Creek drainage, a section along the south boundary of the park north of Bear Creek and the entire east side of the Continental Divide. Fuels vary considerably within the unit. In some areas, terrain features or weather anomalies would likely influence a fire in unacceptable ways, burning unpredictably where the values at risk are substantial. Currently, prescriptions for managed fires are extremely restrictive in this unit. Various limited fuel reduction methods with some debris burning would be utilized to accomplish protection objectives around developments.

Strategies under Alternative A

Suppression. The suppression strategy would include potential actions such as hand-line construction using hand tools and chainsaws, helicopter water drops, and retardant use where life and property are immediately threatened and to prevent unwanted wildland fire from impacting values to be protected. Camps, staging areas, helispots, security checkpoints, and any other temporary facilities where required would occur under this strategy.

Prescribed Fire. Under the no-action alternative, limited use of prescribed fire would continue at levels of recent years, with a maximum of approximately 100 treated acres per year. The 1991 Fire Management Plan for Glacier National Park contains two identified prescribed fire units: Round Prairie (north side of Round Prairie west of the North Fork Road in the North Fork subdistrict), and Big Prairie (north end of Big Prairie west of the North Fork Road, North Fork subdistrict).

Fire Use. Wildland fires managed for resource benefits would involve actions taken by personnel that include one or more of the following.

- Control line construction (includes trimming, thinning, scraping to mineral soil, removal of selected snags near the line, and constructing escape routes and safety zones where necessary)
- Establishing hose lines/lays (to assist in controlling the fire)
- Ignition operations (aerial or ground) that serve to improve effectiveness along constructed fireline or natural barriers by consuming unburned fuels
- Holding to prevent fire crossing firelines, patrolling to ensure fire stays inside the designated project area, and mopup (extinguishing hotspots along fireline)
- Monitoring of fire effects

- Mitigation actions established in prescribed fire plans would include any pre-identified rehabilitation such as covering bare mineral soil, removing hazards, repairing trails, etc.

Manual Fuels Treatment. Manual/hand preparation of prescribed fire treatment units would continue as described under the Hazard Fuels Management Plan (GNP 1993). The purpose is for firefighter and public safety and improving controllability of burns. Treatment priorities and methods are determined jointly by fire management personnel in consultation with appropriate park staff specialists. Actions would include trimming, thinning, and bucking, piling and burning debris, scattering and burning debris, chipping and removal of debris from the site are options that would continue to be considered.

Burned Area Rehabilitation. Any post-fire rehabilitation actions (e.g., repairing fences, structures, roads and trails; installation of erosion control devices; and reclaiming fire camp, temporary helispots, staging areas and other operational locations) would have had varying degrees of impact requiring mitigation via an approved Burned Area Emergency Rehabilitation (BAER) plan. Stabilization of slopes and other affected features is also included.

Alternative B: Preferred Alternative

Implement a new Fire Management Plan that allows for wildland fire use and suppression, and increased use of prescribed fire and increased use of non-fire treatments to meet objectives.

Under a new Fire Management Plan for Glacier National Park, four changes from the current plan are described. The update of the fire management policy is described above. Fire Management Units would be revised (Figure 2.). The park would increase the use of prescribed fire under a multi-year treatment schedule (Table 1). The park would increase non-fire treatments (mechanical fuel reduction) to meet resource objectives.

Under the concept of adaptive management, the Fire Management Plan's stated goals and objectives and implementation of planned actions that would meet them is based largely on policy, monitoring data, evaluations of prior actions, and application of best available science. As new information becomes available, annual work plans and project plans (i.e., burnplans, mechanical fuel reduction plans, etc.) that follow the multi-year treatment schedule can be adjusted accordingly in response to new resource information, changing visitor use patterns, or changes in park operations.

Fire Management Units (FMUs)
The FMUs (Figure 2) were created to meet recent changes in policies and management emphasis. The FMUs have been jointly developed with the Flathead National Forest to accommodate mutual agency management direction where common boundaries exist and to maximize flexibility in management options for wildland fires. The boundaries shown on Figure 2 are conceptual and may change as conditions warrant. Situations that may cause the areas described below to change may include large fire occurrences, changes in land management

objectives in adjacent areas and completion of fuel reduction projects. Any changes would be identified and reviewed and documented prior to each fire season.

FMU A—Wilderness/Resource Benefits

This FMU contains proposed wilderness lands that are managed for wilderness values. The vast majority of fires remain small during all but the most extreme fire seasons and can be easily suppressed in the initial attack stage. However, there is potential during dry years for fires to become large. Fires within this unit tend to stay within parameters and trend to the northeast to higher elevations where the lack of fuel no longer supports fire activity. Starts within this unit have a low probability of impacting pre-existing human values. Therefore, fires can be managed to restore their natural role, reduce high fuel loads, and maximize long-term resource benefits. Values to be protected are generally minimal within the unit, but fires could impact adjoining units that have much higher values. Wildland fire use is a primary strategy used in this FMU, although other strategies can be employed.

FMU B—Mixed Values

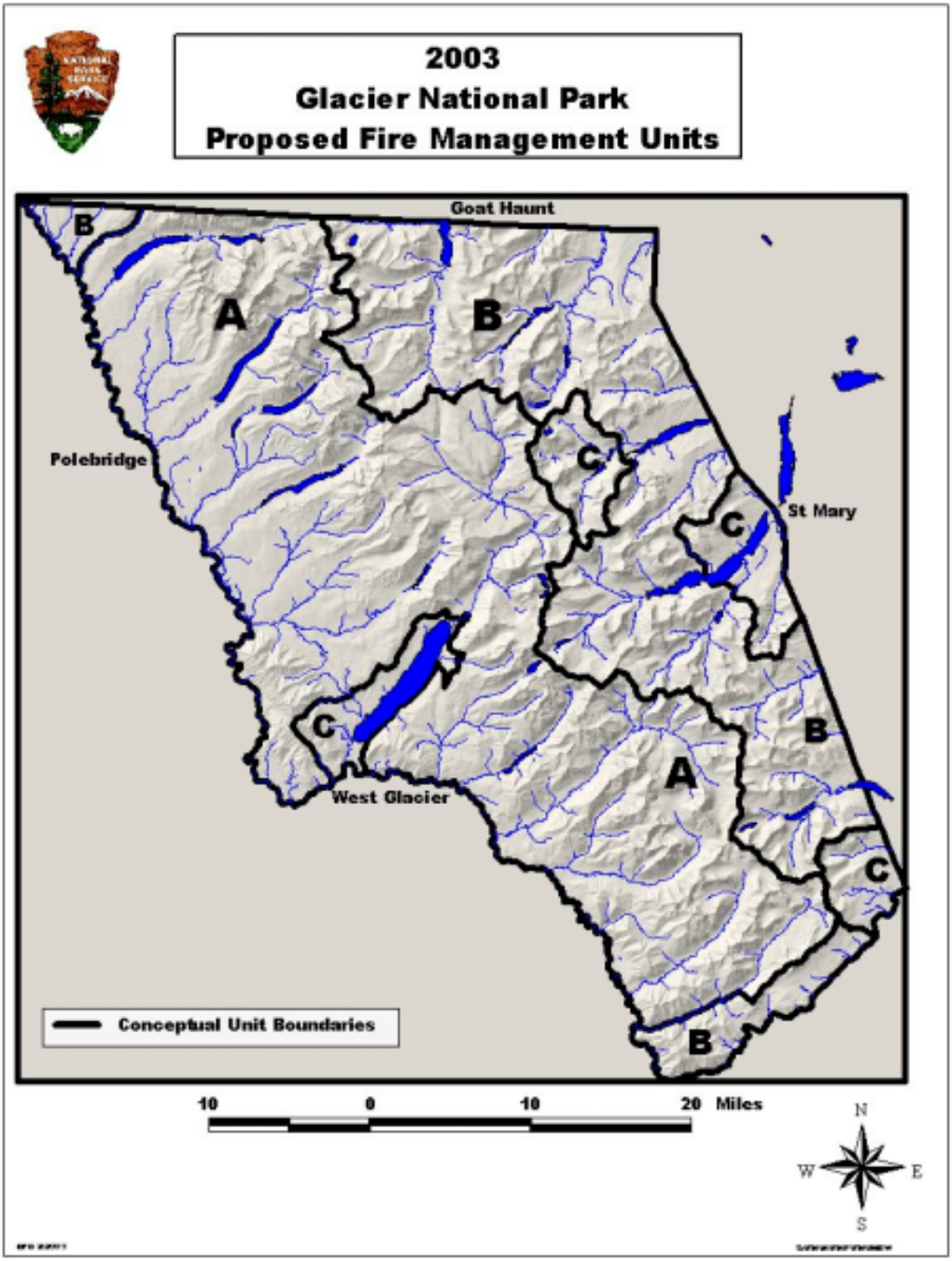
This FMU includes remote locations as well as urban/wildland intermix areas. Fires within Unit B, except for the northwest corner of the park, tend to be infrequent and stand-replacement. Management strategies include prescribed fire, full suppression, or a combination of actions. Wildland fire use is an option within this FMU, but the prescriptions are more restrictive than those in FMU "A" because of values at risk. Modified suppression (i.e., more limited suppression action) is preferred to total suppression where it can be safely applied to reduce fuel loads and return fire to the landscape, while protecting park neighbors and values.

FMU C—Developed Area Concerns

This FMU contains areas of urban/wildland intermix. Fire starts within these units are typically managed with a suppression response. The four areas within the unit have a wide variety of vegetation associations, fire behavior, and fuel loads. In some situations, modified suppression may be an appropriate tool and should be considered where it can be safely accomplished. The use of prescribed fire and mechanical fuel reduction treatments will be emphasized in this unit.

The FMUs each cover portions of the Visitor Service Zone, Day Use Zone, Rustic Zone, and Backcountry Zone, Glacier National Park's management zones described in the GNP General Management Plan (NPS 1999a). These zones are each managed differently for visitor enjoyment and resource protection. The Fire Management program would take into consideration the park objectives for each zone as fire management activities are planned and implemented.

Figure 2. Fire Management Units for Alternative B (Preferred).



Prescribed Fire under a Multi-year Treatment Schedule

Under Alternative B, a majority of the acreage treated in Glacier National Park would likely be the result of natural fires (which have treated an average of 4,500 acres per year during the past 15 years). Though Glacier National Park prefers to allow natural, lightning caused fires to achieve resource benefits, there are circumstances where prescribed fire would be used to achieve specific objectives under more controlled conditions. Additionally, prescribed fire would be used to reduce fuels around developed areas or dispose of woody debris after mechanical reduction work.

The proposed prescribed fire program under Alternative B would increase in scope and extent from the current program. The size and locations of the prescribed fires would vary according to goals and objectives and weather conditions during the fire season. On the average, the park would expect to treat between 100 and 500 acres annually, however, some years larger burns may be planned.

Prescribed burns would be conducted for three broad reasons: to restore fire to the ecosystem, to reduce fuel loads, and to dispose of debris. Descriptions of potential treatments within these three categories, along with general locations and acreages are given below. Note that many of the proposals are still in the development stage and that the figures are approximations only. Many of the proposals were initiated by resource managers and biologists who identified fire as a potentially beneficial restoration tool. In the interest of applying the best available science, fire management personnel are collaborating with universities, USGS research scientists and other subject matter experts before writing prescriptions and tactics for the application of fire.

1) **Restore fire to the ecosystem:**
Prescribed burns with resource objectives would occur primarily in areas where fire exclusion has had negative impacts on specific resources, and where waiting for or allowing a natural fire would be detrimental to natural resources. These resource burns would typically occur in Fire Management Units A and B. Though allowing natural fire to achieve resource benefits is preferential to prescribed fire in most cases, Alternative B (preferred) would allow managers to examine and utilize fire as an alternative to mechanical methods where ecological and socio-political concerns preclude wildfires.

Figure 3 illustrates the boundaries of prescribed fire project areas. Within these project areas, smaller prescribed burn units have been designated for treatments between 2003-2007, and future burn units would be identified from 2008 on. The project area boundaries in Figure 3 represent general areas where vegetation, natural barriers, and resource objectives overlap to provide the greatest chance of success with prescribed fire. The planned burn units and acreages for each are listed in Table 1. Beyond 2008, exact locations and sizes of burns have not been determined, however, an average of 500 acres treated per year is anticipated.

Figure 3. Proposed Prescribed Burns Project Areas.

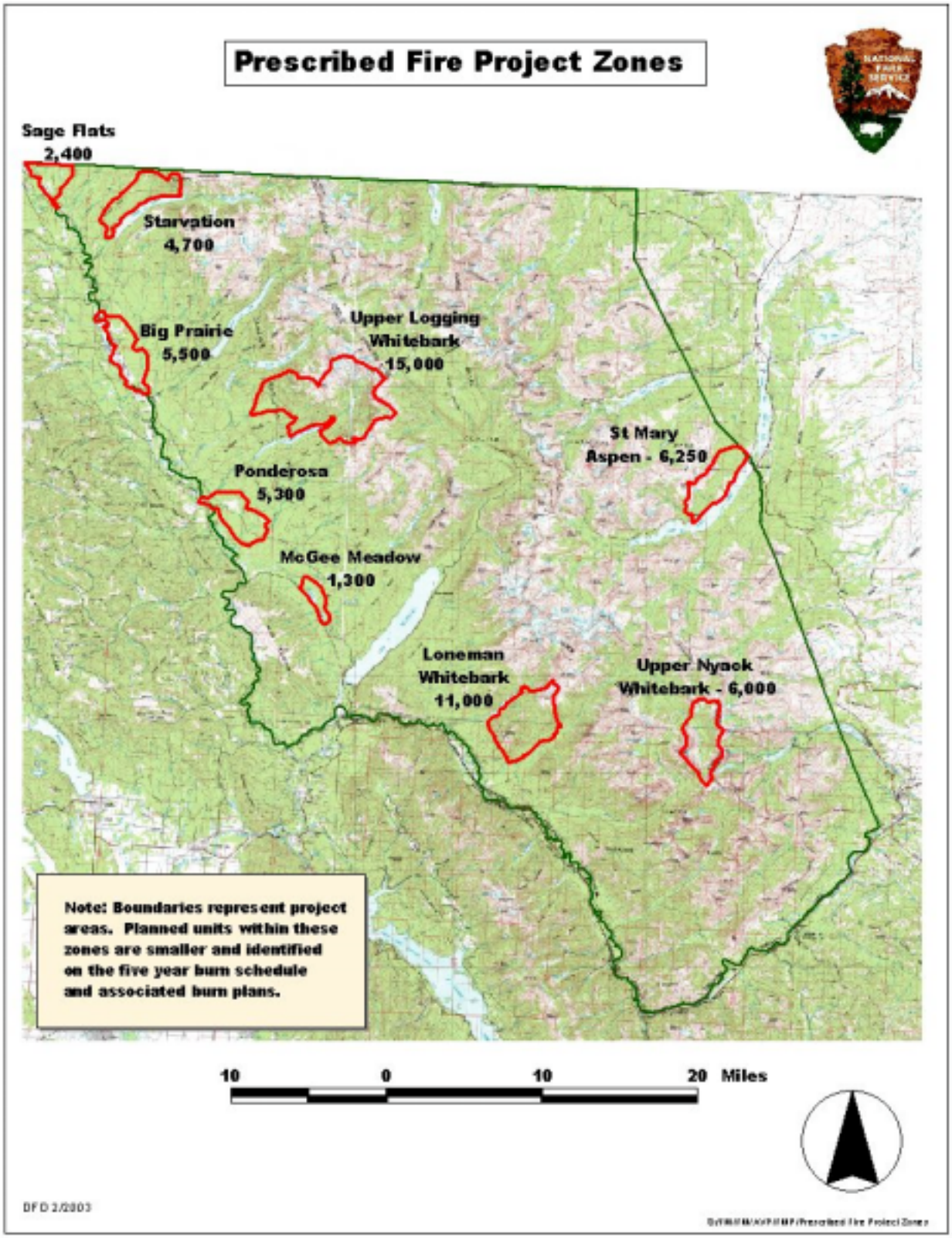

Prescribed Fire Project Zones
Sage Flats
2,400
Starvation
4,700
Big Prairie
5,500
Upper Logging
Whitebark
15,000
St Mary
Aspen - 6,250
Ponderosa
5,300
McGee Meadow
1,300
Loneman
Whitebark
11,000
Upper Nyack
Whitebark - 6,000
Note: Boundaries represent project areas. Planned units within these zones are smaller and identified on the five year burn schedule and associated burn plans.
10
0
10
20 Miles
DFD 2/2003

Table 1. Multi-Year Treatment Schedule (proposed units within project areas).

Prescribed Burn Unit	Acres	Initial Burn	Target Date	Comments
North Fork Grassland				
Bericlaus #1	21	1992	2003	
Bericlaus #2	19	1993	2003	
Bericlaus #3	32		2003	
Indian Tree #4	65	1996	2003	
Miller Cabin #5	75	1993	2003	
Aspen Corner #6	92	1996	2002	
Cedar Tree #7	100	1996	2003	
Ladder #8	60	1996	2003	
Dry Fork #10	82	1988	2005	
Johnnie #11	96	1988	2005	
Airie #12	122	1988	2005	
Round Prairie	46	1992	2005	
McGee Meadows	180		2006	
Sage Flats	160		2006	
Forest Restoration-Underburn				
Ponderosa 1B	50		Assess	Portions burned in Moose Fire
Ponderosa 1C	50		Assess	Portions burned in Moose Fire
Picnic #2	16	1999	Assess	
Ponderosa 4A	23	1998	2008+	
Ponderosa 4B	12	1998	2008+	30-40% burned in Anaconda WFURB. Burned in Moose Fire
Dutch #7	80	1999	Assess	Burned in 1999 Anaconda WFURB. Burned in Moose Fire.
St. Mary Meadows	300		2007	
Forest Restoration –Mixed Severity				
Upper Nyack Whitebark	≈1200		2008+	The whitebark burn with the highest probability of success would be selected for initial research treatment.
Loneman Whitebark	≈1000		2008+	
Logging Whitebark	≈1600		2008+	
Starvation Ridge	≈1200		2008+	
Sage Creek Drainage	≈1200		2008+	
Debris disposal				
Glacier Institute Piles	10		2003	
Camas Dump Piles	5		yearly	
West Glacier/Apgar Piles	varied		2005+	
St. Mary Piles	varied		2005+	
Fuel Reduction				None identified

Note: There are no prescribed fires planned for 2004; fuels focus will be on initiating mechanical Wildland-Urban Interface projects.

A major guideline in determining where to apply prescribed fire for resource objectives is the fire return interval (the average range of time during which research has suggested that fire returns to specific vegetation types in specific locations). The fire return interval is a range that is typically derived from dendrochronology research spanning the extent of time that tree ring data is available. Climate is dynamic, however, and the fire return interval spans much of the peak of the cool moist "Little Ice Age" (Carrera and McGimsey 1981) whereas the last few decades have been defined by an obvious warming trend that is likely to continue. Although droughts have remained commonplace, fire frequency for the 20th century declined sharply. These findings clearly implicate effective fire suppression at the landscape level (Barrett 1997). Were suppression efforts not so successful, a current analysis of the dendrochronological record would most likely have seen the average return interval shortened considerably across much of the park. Regardless if areas would have exceeded their return interval, most proposed burns would be conducted on the far end of this average range. Return intervals are an important factor, however, all proposed burns are being examined for other ecological and socio-political reasons beyond this single factor.

- *Restoring fire to prairie*. Focused on Big Prairie and Round Prairie along the North Fork of the Flathead River and Sage Flats in the Spruce Creek drainage of the North Fork. The objective is to restore fire to this area which will reduce encroachment of conifers into the prairie and stimulate bunchgrass. The total acreage burned under the multi-year schedule would be approximately 800 acres divided among 23 project areas. Pending further investigation, prescribed fire could be used as a management tool to discourage conifer encroachment into east side meadows as well. Such a program would be tested on trial basis prior to any extensive treatment.

- *Restoring fire to forest (underburn).* Focused on ponderosa pine and western larch communities along the inside North Fork road (Glacier Route 7) and low elevation aspen communities on the east side of the continental divide. The fire return interval in the lower elevations of the North Fork are historically shorter than in many other forested park locations, a fact that may be attributed, in part, to anthropogenic burning. Whether lightning or human caused, the source of these ignitions is considered natural and resulted in historically open stands of larch and ponderosa. In addition to their resource value, many of the larger ponderosa pines show scars from cambium stripping and are valuable cultural resources to be protected.

  There seems to be little doubt that fire suppression has interrupted the natural fire frequency in the North Fork Valley (Barrett 1983). The expansion of the average return interval over the past several decades has resulted in coniferous regeneration (ladder fuels) that threaten older age trees. Many proposed units were burned during the 1999 Anaconda and 2001 Moose Fires and, in some cases, have provided an example of how a large wildfire altered non-lethal fire regime can cause undesirable tree mortality. For example, four fire monitoring plots that were established and read prior to and after the Moose Fire showed an average of 71% mortality in mature overstory ponderosa pine (NPS files).

  Coniferous encroachment and a decline in vigor limiting regeneration are also occurring in Glacier's aspen stands and fire suppression is a suspected factor in this alteration. Aspen stands are being considered for prescribed fire underburns in the North Fork and

on the east side of the park, especially in the St. Mary drainage. Approximately 300 acres would be selected for treatment within the east side aspen project area, with an additional 200 acres of ponderosa pine underburn in the north fork area for 2003-2007.

Writing prescriptions for fire use in aspen stands is a complicated matter. The mix of fire regimes in the northern Rocky Mountain front are substantially more complex than in the Yellowstone area where aspen are well known to be fire dependent (Lynch 1955). Historical fire regimes around Glacier were highly variable depending on microclimate, moisture regime, fuel type, and even variable human occupation in prehistoric times (Barrett 1993). Although stands adjacent to Douglas fir stands are known to have fire return intervals of 25 to 50 years, most aspen stands in Glacier were believed to be more than 80 years of age in 1970 (Habeck 1970a) putting them at more than 110 years today. Defining a window where conditions are dry enough for the fire to be effective, yet not so dry as to present an unacceptable risk of spread beyond the treatment area would be a challenge. Our most likely opportunities for successful use of fire in east-side apsen stands would be along the aspen-conifer ecotone near the boundary to help rejuvenate overmature stands and create living firebreaks near adjacent private properties (Barrett 1993).

- *Restoring fire to forest (mixed severity/stand replacement).* Areas of consideration included vegetation types that historically exhibit some component of stand replacement fire. Proposed areas would typically consist of a mixed conifer component at mid to upper elevations in comparison to the low elevation underburn and prairie objectives. Natural barriers are preferred for this type of ignition. Spring burning is an option that is being considered in order to utilize snowpack on the north slopes as a containment line. Proposed areas include the Starvation Ridge and Sage Creek areas and the south facing slopes in the Middle Fork (between Double Mountain and Running Rabbit Mountain). No acres have been identified for mixed severity/ stand replacement burns between 2003-2007. One unit of 1,600 acres or less is anticipated to be treated in 2008.

  Whitebark pine and bighorn sheep researchers are currently studying the potential of moderately sized prescribed fires to restore populations that have been altered by disease and vegetative changes. Current research is being conducted with a hypothesis that decades of fire suppression have decreased the size and increased the insularity of individual patches of bighorn sheep habitat (Keating 2002). In addition to white pine blister rust (*Cronartium ribicola*), mountain pine beetle (*Dendroctonus ponderosae*) and fire suppression have played a role in a major decline in whitebark pine in Glacier National Park. Forty-four percent of the whitebark pine trees in the park are dead. Of those still living, 78% are infected, while 26% of them have dead tops and are thus no longer reproducing (Kendall and Keane 2001). Options for providing sites for whitebark pine regeneration include allowing wildfires to burn near historical levels and having more management-ignited burns (Kendall 1994). Research across the northwest and successful prescribed fires in the past have shown positive preliminary results (Keane and Arno 1996).

  Locations for whitebark pine burns would be determined by overlapping maps of locations with the greatest potential for restoration benefit with vegetation maps of areas at the furthest extent of their return interval (Peterson 1998). Additionally, areas would be selected based on known occurrences of historic fire suppression actions. The upper

slopes of the Logging Drainage have been examined for mixed severity burns with whitebark restoration objectives.

Though typically a secondary objective to resource goals, mixed severity prescribed fire may be utilized in strategic locations in order to allow for greater opportunities to manage future fire use incidents by creating a mosaic or fuel break in areas where escape under natural conditions would be a concern. For example, historic fires have crossed the continental divide at Firebrand and Marias Passes (Barrett 1986). Currently, managers must take a more conservative approach and typically suppress fires in the far south end of the park due to the potential that they could become large conflagrations east of the divide. Moderate intensity burns at the mid to upper elevations in these drainages, when utilized to meet resource objectives, would serve the added benefit of securing the passes so that larger natural fires could be managed in-season at the lower elevations to the west.

2) Fuel Reduction:
Fuel reduction burns typically would not be conducted more than 1/8 mile from developed areas and would, therefore, occur most frequently in Fire Management Unit C. Fuel reduction may serve as a secondary or tertiary objective in units A and B but would not be proposed as a primary objective for prescribed fire in these units. Fuel reduction could take place in any vegetation type that surrounds developed areas. The objectives would be less focused on resource objectives than on creating conditions that would keep flame lengths near developments to under four feet (the threshold at which firefighters can effectively fight the fire). No specific locations have been identified for fuel reduction burns between 2003-2007. Small underburns could occur after mechanical fuel reduction activities near developments.

3) Debris Disposal:
Debris disposal burning piles of debris and broadcast burning around developed areas or other values to be protected, to reduce fuels and enhance defensible space. Secondary objectives include the removal of evidence of handwork and to improve aesthetics and promote a natural appearance. Under Alternative B, debris disposal burns would increase as a result of the increase in mechanical wildland urban interface fuel reduction. In areas where mechanical reduction is occurring (up to 500 feet from developed areas) and where the material was not removed or chipped, piles would be constructed in the project area for burning in the spring and fall has been conducted. Approximately 10 acres per year would be treated using debris disposal burns.

Increase use of Non-Fire Treatments (Mechanical Fuel Reduction)

The purpose of implementing wildland-urban interface fuels management at Glacier National Park is to protect human life and preserve developments, park infrastructure, and cultural resources of the park. Under both alternatives, Glacier's developed areas would be managed as full suppression zones, however, protecting structures threatened by large fires under current fuel conditions would be largely unsuccessful. To fight fire safely and effectively from the ground, flame length must be less than four feet. It is not uncommon in the timber fuel types found in Glacier to have crown fire flame lengths exceeding 100 feet, with averages of 50 feet. For this

reason a proactive approach to fire management, including mechanical fuel reduction, is required near developed areas.

The National Park Service's fire management program must balance protecting natural and cultural resources with providing for the enjoyment and safety of the people. With a greater understanding of fire ecology and fire behavior, we are expanding our concept of the developed area to include a portion of the forested area that surrounds them. Fuels management is undeniably a further intrusion of human impacts into natural areas, and an expansion of the developed areas that was not anticipated when the developments were created, but to a wildfire, forest and structures are simply fuel. To maintain the distinction between wilderness, where fire is encouraged, versus developed areas where all fires are suppressed, fuel reduction at the interface is needed.

Many of the developed areas in the park are surrounded by mid to late successional lodgepole pine stands with the likelihood of a large fire increasing over time. While the public may perceive healthy, aesthetically pleasing mature forest, this is in fact an artifact of fire suppression. Seventy years ago, for example, after the Halfmoon fire in West Glacier, the natural scene around Apgar consisted of regenerating patches of early successional forest. In an unaltered system, late successional lodgepole stands are burned in a fire and then regenerate. Human manipulation around developed areas is necessary to maintain lodgepole forest in early to mid-successional stages.

While fuel reduction in the fringe of forest around developments has the potential to eliminate or alter some wildlife habitat, the objective is to create a defensible buffer around developments to allow firefighters to effectively suppress fires threatening structures. There are two tools managers use, often in conjunction, to manage fuels and maintain defensible conditions: mechanical removal with chainsaws, and fire. Prescribed fire is sometimes preferred to mechanical treatment alone in that it allows the bulk of the nutrients to remain in the system, as natural fire does. Prescribed fire adjacent to most developed areas, however, is often unsafe unless the fuel load is first reduced mechanically. Though not as natural as fire, mechanical fuel reduction would use techniques to mimic the random, mosaic effect of frequent moderately intense ground fire.

Current fuel conditions around many developments cause the park to suppress many naturally ignited fires that could instead be managed for resource benefits and ecosystem processes. The flexibility to manage natural fire for resource benefits in the Apgar Range, for example, would be severely limited until the West Glacier and Apgar developed areas have undergone some level of fuels treatment. Until defensible areas are created around the developments, many beneficial fires will continue to be promptly suppressed. For these reasons, the park prefers alternative B and the use of mechanical reduction as a management tool.

Location of Fuel Reduction Efforts:
Mechanical fuel reduction on park lands would focus on the wildland-urban interface communities in Fire Management Unit C. These priority areas include, but are not limited to: Apgar, Cut Bank, Glacier Park Headquarters Compound, Many Glacier/Swiftcurrent, Rising Sun, Saint Mary, Two Medicine, and Upper Lake McDonald (Ranger Station and Lodge).

Secondary areas that would be evaluated and treated include backcountry areas in zones A and B that contain a higher concentration of developments (i.e. ranger stations and developments at Goat Haunt, Kintla, Bowman, Belly River, Walton, etc.). Backcountry cabins, lookouts and other isolated values in zones A and B are generally a lower priority as they can often be protected in advance of a fire. These isolated values may receive some level of mechanical fuel reduction, though standards would typically be much less intensive than those in the urban interface.

The amount of fuel reduction in the urban interface areas would vary depending on many environmental and socio-political factors that include, but are not limited to:

- The impact to aesthetics, cultural resources, and natural resources (including exotics and threatened and endangered species).
- The type, age, amount, diversity, volatility, fire history and size of the vegetation around the area of concern.
- General weather patterns such as wind directions and speed, lightning probability, length of fire season etc.
- The construction, design, materials and value of the structures at risk.
- Risk of human caused fire, human density, ease of evacuation etc.
- The topography of the surrounding area.

Each site would be analyzed according to the above criteria with an emphasis on conducting the reduction in a manner that is visually appealing and ecologically diverse. Fuel reduction is as much art as science and there are no single fuel reduction standards that apply to all locations and all vegetation types. The science comes from utilizing knowledgeable practitioners that understand fire behavior and forest ecology and, from experience, research and computer modeling, can apply the minimal standards to reduce the fire danger. The art comes from continually visualizing how a fire would burn and attempting, as best possible, to mimic a moderate intensity fire by manually manipulating the forest environment with a constant focus on aesthetics. Inflexible standards could be drafted for all fuel conditions that would protect the structures, but without allowing for a continuous analysis and flexibility (the art of the project), a 'manicured' look would result. Some generalized standards can be applied, however, and are listed below:

Treatment area size:
General fuel reduction standards would require more intensive fuel reduction near the value at risk (to provide defensible space). Beyond that, fuel reduction would become less intensive and eventually feather into the surrounding vegetation at distances that typically would not exceed 300-500 feet. In most of Glacier's developed areas, 400 feet is the baseline treatment distance from the edge of the nearest building for all prescriptions (calculated using radiant heat and flame length data). The 400-foot figure is derived from an input of a 100-foot flame length, the high average flame length for Glacier fuels.

Treatment standards:

Closest to the structure, fuel reduction would consist of removal of most or all of the ground fuels, thinning of most or all of small to mid-diameter (and hazardous or volatile large diameter vegetation), and limbing of the largest trees. Motorized chainsaws and brushers would be used in addition to hand operated pole saws, handsaws, loppers and clippers. Eighty percent of the dead and down fuels would be removed. Logs that are well imbedded into the ground layer and a portion of the elevated fuels (that do not provide a fire ladder to the canopy) would be retained to avoid a groomed appearance. Almost 100% of the ground fuels would be removed within 50 feet of the structure, however, the concentration of ground fuels retained would increase with the distance from the value of concern and phase into natural or near natural conditions at 400-500 feet.

Fire scientists have divided vegetation into13 fuel models, each exhibiting a separate set of fire behavior characteristics. These characteristics can be quantifiably described and combined with other relevant data in mathematical formulas in order to predict fire behavior or fire danger (Rothermel 1983). In Glacier, with a few exceptions, a single fuel model can describe each developed area. The pre-treatment model is generally fuel model 10, a forest model characterized by heavy ground fuels (average 17 tons per acre), closed canopy and high flame lengths. The desired forest condition needed to achieve the stated goals of the fuel reduction plan is represented by a variation of Fuel Model 8. Model 8 is a forest model and is generally characterized by sparse ground fuels (average 6.5 tons per acre) and slow-burning ground fires with low flame lengths (Anderson, 1982). Model 8 does have the potential of supporting crown fire and it is sometimes desirable to thin the canopy in developed areas more than is represented by this model.

It takes a certain amount of fire intensity on the ground to carry fire to the crowns. Fine ground fuels, not trees, are the primary carriers of a fire. Ground fuels are therefore the focus of fuel reduction, however, dry weather conditions can carry fire to the crowns even in fuel reduction areas. Computer modeling has shown that the weather conditions required to dry fuels to the point that they will carry fire into the crowns (in the target Fuel Model 8 condition) include thousand-hour fuel moistures of less than 20% and relative humidities of less than 30% (Andrews 2002 and Fire Cache records) . During peak fire seasons (occurring several times per decade), these are the normal conditions in Glacier's forests. When these conditions are combined with wind, individual tree torching can become a crown fire. To reduce the possibility of a canopy fire running into the fuel reduction area, crowns must be sufficiently spaced to reduce crown to crown transfer of fire.

Trees that would be removed would primarily consist of small diameter saplings and poles that provide a 'fire ladder' to the canopy. The largest 'old growth' trees are not a fire hazard per se and would not be removed unless other factors, such as rot, made them hazardous to people or structures. In coniferous Fuel Model 10 models, roughly 40-80 percent of the understory trees would be removed, followed by 20-60 percent of the pole sized intermediate sub-canopy trees and less than 10% of the co-dominant overstory. Many large trees can be limbed instead of removed. Species composition also plays a significant factor. Volatile, low branched trees like firs, for example may be spaced at near 20 foot intervals within the first 50 feet of the treatment area, whereas lodgepole, with its lack of lower branches, may be spaced at around 8-12 feet.

As with ground fuels, canopy spacing would be greater near the structures and become proportionately tighter in relation to the distance from development. As distance from the structures increases, spacing may be applied to clusters of trees rather than solely to single stems. Pockets of trees that torch in the treatment area are not undesirable if the flames do not have a continuous path of fuels to the developed area. To reduce crown to crown transfer of fire these clusters would be separated by roughly 20 foot crown spacing. Managing spacing by feathering and clustering groups of trees rather than applying it to individual stems creates greater visual screening, mimics a fire mosaic and allows for opportunities for forest regeneration by retaining representative age classes.

- All work performed under the Hazard Fuels Management Plan and subsequent site-specific treatment prescriptions would be monitored by the Fire Management Operation.
- Resource sensitivity including aesthetics would be considered in all prescriptions.
- The borders of treatment areas would be feathered in an irregular pattern and of increasing fuel density (with distance from the development) in order to improve the visual quality of the border areas.
- During the thinning operation, clumps of trees would be left for aesthetic purposes, depending upon their potential to contribute to adverse fire behavior. Irregular spacing of trees that are left would be encouraged in order to maintain a random appearance.
- Some standing dead, diseased, or insect-infested trees, when not a safety hazard, would be left for wildlife habitat snags.
- Dead and downed material to be removed would be stacked in small piles and burned or hauled. Broadcast burns may be acceptable in some cases, but there is a risk of excessive mortality in stands of thin-barked species such as lodgepole pine. Chipping would be an option, however, the volume of material produced could make it less viable in some units.
- Pruning limbs to a prescribed height would be discouraged as it results in an extremely unnatural, “manicured” look. Similar treatment results can be achieved through a slight increase in thinning and a more complete removal or rearrangement of ground fuels
- On-site burning would be carefully conducted to reduce fire intensity and duration in order to protect underlying soils. Ground disturbance during the reduction effort would be minimal as mechanized equipment and skidding would not be utilized.
- All stumps from thinned trees will be cut as close to ground level as possible. Stump grinding could be an option in developed areas.
- Efforts would be made to leave an appropriate species composition that reflects the natural succession of the forest.
- Prescribed fire is an acceptable option for creating or perpetuating the desired forest condition. It can be used in place of, in conjunction with, or subsequent to mechanical treatment. Determining which method or combination is used depends upon the site characteristics, constraints, and treatment objectives.

Mitigation Measures

The Code of Federal Regulations (40 CFR 1508.20) defines "mitigation" as including the following.

- Avoiding the impact altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

These mitigating and monitoring measures would reduce any potential effects to key ecosystem components and document that undesirable effects are not occurring as programmatic objectives are met. The following mitigating measures would meet most definitions listed for mitigation above. These mitigating measures are programmatic in scope and help meet the objective of minimizing adverse impacts resulting from the preferred alternative. Appendix E lists environmental compliance requirements.

Mitigation for Air Quality. To protect Class I air-quality-related values, including visibility, all fire management activities other than suppression of unwanted wildland fires would follow Montana/Idaho Airshed Group guidelines for Best Management Practices and ensure that particulate concentrations do not exceed standards that may result in reduced air quality or impact visibility and public health.

Glacier National Park is a member of the Montana/Idaho Airshed Group, whose membership includes those agencies with an interest in the use of fire for resource management purposes and that are committed to conserving Montana's air quality. The state is divided into airsheds, of which Glacier National Park is in airshed numbers 2 and 9. The Montana Department of Environmental Quality requires that members submit a list of planned burns to the Monitoring Unit in Missoula, Montana. From information contained in the permit application, the Missoula Monitoring Unit issues daily decisions that can either restrict or allow burning to proceed/continue.

The burning seasons and notifications to be followed under Air Quality Bureau requirements are as follows:

- March 1 through August 30 – Major open burning requires a permit from the Department of Environmental Quality. Burners must employ "Best Available Control Policy" (BACT).
- September 1 – November 30 – Major open burning requires a permit from the Department of Environmental Quality (DEQ). Burners are required to call the Smoke Management hotline prior to ignition and to observe burning restriction issued by the DEQ.

- December 1 through February 29 – BACT includes burning only during time periods specified by the DEQ.

Specific mitigating measures that would contribute to reducing adverse effects on air quality in the park resulting from prescribed fires or wildland fires managed for resource benefit include the following (MDEQ 2001).

- Submit burn plans to the Monitoring Unit, Missoula, Montana
- Provide information on type, acres, location, and elevation
- Formally coordinate burns among members
- Monitoring unit may issue restrictions through the airshed coordinator(s)
- Ensure adequate smoke ventilation and to adjust ignition patterns, confinement actions, etc. with weather patterns
- Ensure that burn prescriptions and ignition plans provide for optimal smoke dispersion for the specific circumstances of the fire
- Public health advisories based on measured concentrations of particulates may be issued by Montana Department of Environmental Quality
- Employ Best Management Practices (BMPs) to minimize smoke production and impacts, including reducing emissions by excluding fuels from burning, and burning to increase combustion efficiency
- Minimize smoke effects around roads or highways, airports, and other sensitive areas
- Employ informational and interpretive messages to inform visitors and public
- Monitor particulates and smoke concentrations from the West Glacier air quality station
- Initiate suppression measures if smoke effects cause exceedences of the National Ambient Air Quality Standards (NAAQS) or significant visibility impairment.
- Employ Best Available Control Technology (BACT)
- Promptly notify Smoke Management Unit./Montana DEQ of any wildland fire use.
- Provide prestated objectives and predefined geographic areas for wildland fire use to Smoke Monitoring Unit/ Montana DEQ.

Mitigation for Natural Soundscapes. Impacts of noise generated by chain saws used for prescribed burn preparation and mechanical fuel reduction would be mitigated by scheduling work during hours when visitors use is at its minimum for the day or time of year. Work would not occur near campgrounds, residences or hotels in the early morning or late evening hours. Most mechanical fuel reduction would occur in developed areas, but much of the prescribed burning is planned for areas in or near the proposed wilderness. Noise impacts from the fire itself are considered natural. Use of natural barriers and evening humidity recoveries on prescribed fires would limit the use of chainsaws and pumps to short duration noise just prior to and briefly during the burning operations.

Mitigation for Threatened and Endangered Species and Species of Concern. Five wildlife species protected under the Endangered Species Act occur in the park: the threatened bald eagle (*Haliaeetus leucocephalus),* grizzly bear (*Ursus arctos horribilis*), bull trout *(Salvelinus confluentus),* and Canada lynx (*Lynx canadensis)*, and the endangered gray wolf (*Canus lupus).* The slender moonwort (*Botrychium lineare)* is currently listed as a candidate plant species.

The Montana Field Office of the U.S. Fish and Wildlife Service (USFWS) forwarded recommendations to Glacier National Park for wildland fire program operations (Appendix G). The recommendations are summarized below.

- That the USFWS be contacted as soon as reasonably possible in the event there is a wildfire incident within Glacier National Park
- That the USFWS be involved in Burned Area Emergency Rehabilitation (BAER) team activities
- That Glacier National Park consider updating post-fire baseline data for all threatened and endangered (T&E) species to document changes in affected watersheds

In addition to the recommended measures listed above for mitigation, the following mitigation measures would also be considered for habitats of all T&E species and species of concern:

- Confer with or consult appropriate park resource management staff where ignition, mixing of fuels and helicopter bucket dipping and/or drafting operations from streams and lakes is proposed in areas of known or potential listed or sensitive species habitat
- Minimize low level helicopter flights
- Avoid nesting and roosting areas of listed species; avoid wolf denning and rendezvous areas; ensure that briefings to fire personnel include precautions and guidelines when operating in grizzly habitat

Mitigation for Soils. Unwanted wildland fires are treated as emergency incidents. These situations may call for rehabilitation efforts applied following the fire's passage, such as installation of erosion-control devices on steep slopes or covering bare soil to prevent soil movement and promote rapid revegetation of a site. Mitigating measures would be specifically identified following on-site evaluation, usually by a BAER (Burned Area Emergency Rehabilitation) team.

Effects on soils during prescribed fires would be mitigated largely in the pre-planning process, where prescribed fire plans include protection objectives for soils and prescriptions that call for low-intensity fire. Soils protection objectives are similarly developed in consultation with a resource advisor during the management of wildland fire for resource benefit.

Mitigation for Vegetation. Mitigating impacts to park native vegetation associated with all fire management strategies consist of actions including, but not limited to, the following.

- Control of weeds/exotic populations that may invade burn treatment sites
- For all wildland fires (suppression and wildland fire for resource benefits) and prescribed fire projects, natural barriers (i.e., rock outcroppings, surface water, open meadow, barren areas, ice, etc.) and/or man-made features (roads, trails, rights-of-way, etc.) would be considered in identifying control lines or Maximum Manageable Area. A resource advisor from the park may assist in cases where sensitive vegetation habitat exists or is suspected. See also the plant survey discussion below
- Manual removal of trees in hazard reduction projects where only deemed necessary following an approved project plan

- Consulting with natural resource specialists on proposed locations of camps, staging areas, helispots, or other management actions that may remove or disturb native vegetation
- Before prescribed fires and/or non-fire fuels management actions, conduct a plant survey when indicated to determine if any species of special concern (see list in Appendix D) in Montana or Glacier National Park occur on the proposed project area
- Consideration of the known effects of fire and non-fire treatment on limited/sensitive species in mitigation planning
- Following project work, constructed lines would be re-covered to prevent erosion and promote vegetative recovery.

Exotic Species. NPS management policies that describe program guidance for preventing accidental introductions of exotic species also apply to fire management (NPS 2001g), and consist of the following.

- Before initiating prescribed burning or fuel reduction projects identify the exotic species present or likely to invade the disturbed areas, take measures to prevent such invasion, and assess those measures. If the risk of invasion by exotic species is high at a particular site, prescribed burning or mechanical fuel reduction would require consultation with Integrated Pest Management to weigh the cost and benefits of the project and to greatly reduce the possibility of any introductions.
- Work with neighbors to control exotics on neighboring lands before they become established in the park.
- Alter natural disturbance regimes to restore native vegetation.
- Employ informational and interpretive messages to provide prevention information on exotic species introductions to visitors and public.
- During rehabilitation of high-severity burned slopes, straw certified by a county weed district to be weed seed free would be considered as needed.

Most exotic species occur in formerly or currently disturbed sites, such as burn areas, because of the removal of duff and exposure of mineral soil. Preferred fire-use strategies should support the perpetuation of native plant communities and successional stages if low-intensity surface fires are managed to protect soils. Seasonality of fire and non-fire treatments that do not favor the growth needs of exotic plants are management considerations along with consultation with the park staff ecologist on a site-specific basis during project planning.

In areas that require further manual treatment, noxious weeds would be surveyed to determine the frequency of weeds present before ground disturbing activities are done. If weeds are found to be present measures would be implemented to help avoid spreading and increasing the abundance of the weeds present. Measures such as persistent cleaning of equipment, low ground disturbance, avoidance of areas by equipment would reduce the chance of increasing weed problems.

Mitigation for Water and Aquatic Resources. Mitigation of fire effects on water quality and quantity and aquatic habitat largely depends on the level of severity and time of year. Increased sedimentation from high-severity wildland fires may directly affect water quality. Careful

application of prescribed fire under best management practices reduces the risk of increased sedimentation concentrations in streams. Seed germination, resprouting, and nutrient cycling serve to quickly restore ground cover above riparian areas immediately after a fire.

Generally, riparian habitat, including its biological resources, has low to moderate susceptibility to fire, since much of the vegetation on streamside banks is green year-round. Fire Use events in riparian areas are considered natural events and little mitigation is required for the fire itself, however, minimum impact techniques would be used during management and suppression actions. Standard best management practices to be used would include not using retardant or foam near streams and lakes, taking extra care when using fire pumps to avoid any gas leakage, and utilizing minimum impact management techniques (MIMT) when "cutting" fireline in riparian areas, and opting for wetlines would be done whenever feasible.

Mitigation for Wetlands. Mitigation measures to protect wetlands would be identified through consultation with the resources staff during project planning that may involve any identified wetlands. On-site protection measures may include adjusting proposed project boundaries or total avoidance, burning at lower intensities, and protection of forest cover in known wetland habitat. Retardant and foam would not be used near wetlands. Operating and filling gas operated machinery would be avoided in wetlands and, when not possible, would be conducted with extra care and the use of catchments. Wetline, natural barriers and burnout will be utilized over cutting wherever possible in wetlands.

Mitigation for Wilderness. All backcountry management activities, including fire management and hazard fuels reduction around backcountry structures, are subject to a *minimum requirement* process. This concept is described in detail below.

Excerpts from the *Glacier National Park Backcountry Management Plan* (GNP 1994) that pertain to impact mitigation for wildland fire management activities in proposed wilderness:

> *In applying the minimum requirement concept, it is important to understand the distinctions between the terms "minimum requirement," and " minimum tool." Minimum requirement is a documented process the NPS will use for the determination of the appropriateness of any proposed actions affecting wilderness.*
>
> *Minimum tool means the use or activity, determined to be necessary to accomplish an essential task, which makes use of the least intrusive tool, equipment, device, force, regulation, or practice that will achieve the wilderness management objective. This is not necessarily the same as the term "primitive tool," which refers to the actual equipment or methods that make use of the simplest available technology (i.e. hand tools).*
>
> *Glacier National Park will apply the minimum requirement concept when making decisions concerning management of the wilderness area. This includes decisions concerning management goals from long-term programs, actions and recurring activities may be approved for an extended period. Approved programs or active*

ties that fail to comply with the terms and conditions of the original request may be revoked by the Superintendent.

Also stated in the Backcountry Plan for Glacier National Park are fire activities, policies and impacts that are subject to the minimum requirement process. They include temporary roads, use of motor vehicles, motorized equipment, or motorboats (chainsaws, rock drills, power brushers, etc.), landing of aircraft, helicopter long-line release of materials, use of mechanical transport (bicycles, canoe carts, wheelbarrows, etc.), new structures or installations (backcountry campgrounds, spike camps, bridges, patrol cabins, toilets, radio repeaters, weather stations, research devices, etc.), major new regulations pertaining to wilderness visitor use and/or resource protection.

The requirement also appears in individual project plans, wildland fire implementation plans that direct the management of wildland fires used for resource benefits, aviation plans that may preidentify flight routes over backcountry for certain types of operations, incident action plans as minimum impact tactics, and the park's Fire Management Plan. Firefighters would be briefed on which minimum impact tactics to employ to ensure that wilderness values are protected while safely and successfully accomplishing fire management objectives. Resource advisors are assigned to incident management and fire use teams.

Mitigation for Wildlife. Mitigation measures designed to protect animal species and habitats are similar to those listed above for vegetative resources and include the following.

- Consult with natural resource specialists on proposed locations of camps, staging areas, helispots or other management actions that may remove or disturb native wildlife
- Select time of year for fire management actions that least affect breeding and/or nesting animals
- Before prescribed fires and/or non-fire fuels management actions, conduct an animal survey when indicated to determine if any species of special concern (see list, Appendix D) in Montana or Glacier National Park occur on the proposed project area
- Consider avoiding potential wildlife corridors between cover areas as well as small patches of cover between the larger cover areas

Mitigation for Aesthetics/Recreational Values. During mechanical fuel reduction, vegetation would be manually feathered in conjunction with prescribed burns in order to maintain aesthetics of the developed areas. To mitigate any potential impacts to visitor and public enjoyment, informational and interpretive messages would inform and educate visitors and the public about the effects of natural fire and the objectives of prescribed fires.

Mitigation for Cultural and Ethnographic Resources. The Fire Plan commits Glacier National Park to complete Section 106 review for each proposed fire project. Glacier National Park intends to consult with the Advisory Council on Historic Preservation, Montana State Historic Preservation Office (SHPO), Tribal representatives, and members of the public as appropriate, in developing a Programmatic Agreement to establish wildland fire, prescribed fire, and hazard fuels reduction protocols for the purpose of compliance with Section 106. Mitigation measures specific to planned projects recommended by the SHPO in consultation would be

included in any burnplans, wildland fire implementation plans (fires used for resource benefit) or incident management plans for suppression actions

During planning for fuel reduction projects, including prescribed fires and manual treatments, the cultural resource specialist would be consulted. Other mitigation actions described below would be included as part of Section 106.

Wildland fires that pose a potential threat to identified cultural resources may require a qualified cultural resource specialist to provide specific on-site mitigation strategies. The following mitigating measures would be implemented as conditions warrant.

- Use protection measures in cultural sites or areas identified by the Cultural Resource Specialist and/or local tribal officials; may include constructing fireline around sites, treating sites with approved retardant, removal of fuels around sites, etc.
- Locate, identify, and isolate sites that are vulnerable to fire effects or human activities.
- Conduct a cultural resource survey when recommended by a cultural resource specialist before prescribed fire and/or non-fire fuels management projects.
- Remove fuel concentrations in close proximity to known cultural sites.
- Educate fire crews about the need to protect cultural resources.
- Minimize ground disturbance wherever possible.
- Conduct post-fire cultural resource surveys to identify, evaluate, and document impacts.
- Perform other site-specific measures to protect cultural sites and features as indicated.
- Consult with cultural resource specialists on proposed locations of camps, staging areas, helispots, or other management actions that may disturb cultural resources.

Tribes in the area are cooperating with the park in an ongoing information exchange that provides the basis for protection protocols. As a matter of routine, tribal officials would be contacted well in advance of planned fire management project work to determine if traditional use areas are included in the planning area.

Mitigation for Park Operations. Short-term inconveniences such as temporary road or area closures, slow traffic, etc., would be mitigated largely with planning, timely notifications, and adequate personnel availability.

Mitigation for Park Neighbors. Mitigation would include consultation with tribes, officials of the Canadian government, officials of state and county governments, and private citizens to identify response measures that are appropriate to a fire situation to ensure protection objectives are met. Decision-tree documentation and prescribed-fire plans would reflect specific mitigation measures needed to protect life, property, and associated values. Timely informational messages to inform park neighbors of fire status and actions being taken by the park are also important mitigating measures.

Environmentally Preferred Alternative

The environmentally preferred alternative is the alternative that would promote the national environmental policy expressed in NEPA [Sec. 101 (b)]. This means the alternative that causes the least damage to the biological and physical environment; it also means the alternative that best protects, preserves, and enhances historic, cultural, and natural resources (NPS 2001c).

The environmentally preferred alternative is the NPS-preferred alternative because it surpasses the no-action alternative in realizing the *full range* of national environmental policy goals as stated in the National Environmental Policy Act. The preferred alternative integrates resource protection with opportunities for an appropriate range of fire uses that promote ecosystem diversity. The following Section 101 criteria are compared with the NPS preferred alternative.

- "Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations"

  The NPS-preferred alternative would enhance ecosystem diversity and general forest health into future generations through the prudent restoration of fire into fire-evolved and fire-dependent ecosystems in Glacier National Park.

- "Assure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings"

  As fuels and native vegetative community structure are restored to more normal ranges of variability across the landscape under the preferred alternative, conditions of safety, health and productivity and therefore pleasing surroundings would be enhanced. The proposed increased removal of dead and down fuels of all sizes would enhance the defensible space around developments or along boundaries by minimizing the intensity of wildfire.

- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences"

  Actions under the preferred alternative would meet resource and protection objectives intended to achieve a broad range of benefits to the Glacier National Park environment as natural disturbance from periodic fire is restored. *Public and firefighter safety is the number one priority of all alternatives*. The Federal Wildland Fire Policy (2001) states: "Firefighter and public safety is the first priority, and all Fire Management Plans and activities must reflect this commitment." The Fire Management Plan for Glacier National Park will direct necessary measures that would ensure the safety of firefighters and the public.

- "Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice"

Accomplishment of objectives under the preferred alternative would support principles of natural and cultural diversity in the area and reduce the severity and risk of wildfires to historic structures in Glacier National Park. The preferred alternative would also help sustain a more diverse and natural ecosystem that would foster a wide range of spiritual as well as recreational activities.

- "Achieve a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities"

  The preferred alternative would not negatively affect the balance between population and resource use in Glacier National Park.

- "Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources"

  Under the preferred alternative, the proposed increase in the use of fire in Glacier National Park under a multi-year treatment schedule would serve to return a more natural vegetative mosaic to the landscape. On the lower slopes of the Middle Fork of the Flathead River for example, mixed-severity burn treatments would open historic winter range and migration corridors and encourage the reproduction of browse species. Another example is in the North Fork valley prairies, where fire can be used to reestablish the historically frequent fire regime that deters tree encroachment, prevents sagebrush dominance, and recycles litter and duff.

Alternatives Considered but Not Further Addressed

During internal and external scoping, three additional alternatives were identified but not addressed further in this analysis.

- **Suppress all fires**. This alternative was dismissed for several reasons, including the inconsistency with federal wildland fire policy, National Park Service policy, and Glacier's General Management Plan (NPS 1999a) that calls for allowing natural processes, including fire, to function essentially unimpaired by human influence to the maximum extent possible.

- **Allow *all* wildland fires to burn without human intervention**. To employ this strategy across the park would result in an undesirable potential for adverse impacts to human life, property, and resource values and threats to neighboring agencies and ownerships. Violations of state and federal laws relating to the protection of air-quality-related values, listed species and habitats, and cultural resources and ethnographic values would be possible. Therefore, it was not analyzed further.

- **Omit the use of prescribed fire at any scale anywhere in the park to accomplish resource management and protection objectives**. This alternative would require management to only utilize manual, mechanical fuel reduction and restrict the flexibility of determining optimum times and conditions to use fire as a natural tool to manage unnatural

fuel buildups and protect values. Even though the park currently treats minimum acres with prescribed fire, to remove this critical tool would only result in further risk of damaging wildland fires. Therefore, this alternative was dismissed from further analysis.

Table 2. Comparison of Alternatives.

IMPACT TOPIC	ALTERNATIVE A: NO ACTION	ALTERNATIVE B: PREFERRED
AIR QUALITY	Short-term effects to air quality would be adverse, moderate and direct. Long-term effects would be negligible to minor and beneficial, as smoke emissions from wildland fires are slowly reduced from limited prescribed fire treatments. Cumulative impacts would be minor and adverse. Trans-boundary effects would be short-term, adverse, and minor to moderate.	Short-term direct effects to air quality would be adverse and minor to moderate. Long-term beneficial impacts are anticipated with increase in fuels treatments and restoration of fire as a natural disturbance. Cumulative effects would be short-term, adverse, minor to moderate; and long-term, beneficial, and moderate. Trans-boundary effects would be negligible to minor in the short-term but moderately beneficial over the long-term.
NATURAL SOUNDSCAPES	Effects to natural soundscapes would be minor, short term, localized and adverse from current levels of prescribed burning and mechanical fuel reduction.	Effects to natural soundscapes would be minor, short-term, localized and adverse due to noise generated from prescribed burning, including preparation activities. Mechanical fuel reduction would have minor to moderate, short-term localized negative impacts. Noise from natural fire is considered a natural sound. Minor, short term localized adverse cumulative effects would result.
THREATENED AND ENDANGERED SPECIES AND SPECIES OF CONCERN	Current management may affect, but would not be likely to adversely affect, listed species or habitats directly or indirectly; short or long term, cumulatively, or trans-boundary effects.	Actions under the preferred alternative may affect, but would not be likely to adversely affect listed species over the short-term or long-term. Long-term moderate beneficial impacts to habitats of listed species are expected. Manual fuels treatments may have localized impacts, but are not likely to adversely affect species or habitat. Cumulative effects would be minor to moderate, localized short-term adverse, and minor to moderate, long-term beneficial.
SOILS	Short-term effects to soils would be adverse and moderate. Long-term effects would be minor to moderate beneficial effects. Cumulative effects would be minor and adverse.	Short-term effects to soils would be adverse, negligible to moderate and direct. Long-term effects would be minor to moderate, and beneficial. Cumulative effects would be long-term, minor, localized and adverse.
VEGETATION	Short-term effects on vegetation would be negligible to minor, and indirect. Long-term effects would be moderate, indirect and adverse. Cumulative adverse effects would be minor to moderate, and trans-boundary effects would be long-term, beneficial and moderate. Exotic species response would have minor long-term adverse effects on native vegetation. Exotic species would likely be increased by vegetation removal and manual/hand fuel reduction work in all areas of the park, resulting in a minor, long-term, indirect adverse effect on the native vegetation.	Short-term impacts would be adverse and negligible to minor. Long-term benefits of moderate intensity would result from fire restoration. Cumulative effects would be minor short-term adverse, and moderate long-term beneficial. Trans-boundary effects would be long-term, moderate and beneficial due to managing vegetation in coordination with agencies. Short-term direct impacts to existing populations of exotic species would be beneficial or adverse, and minor to moderate, depending on species and site conditions. Long-term direct and

IMPACT TOPIC	ALTERNATIVE A: NO ACTION	ALTERNATIVE B: PREFERRED
		indirect effects of managed fire on exotic species are largely unknown.
WATER AND AQUATIC RESOURCES	Short-term impacts to water and aquatic resources would be adverse and minor to moderate. Long-term effects would be adverse, localized moderate effects without increased fuels management. Minor adverse cumulative effects would be anticipated.	Short-term effects to water and aquatic resources would be minor, localized and adverse. Long-term effects would be moderate, beneficial indirect effects. Cumulative effects would be long-term, moderate and beneficial.
WETLANDS	Short-term effects would be negligible; long-term effects would be negligible adverse to beneficial minor; moderate adverse effects possible on all wetland systems following higher severity fires in drought years. Cumulative effects would be beneficial and negligible to minor.	Short-term effects would range from minor, direct and adverse, to minor to moderate beneficial effects due to resulting variations in wildland fire severity. Long-term effects would be moderate and beneficial. Cumulative effects would be long-term, minor to moderate and beneficial.
WILDERNESS	Short-term effects would be adverse, direct, and negligible to minor. Long-term effects would be moderate, indirect and beneficial. Cumulative effects would be long-term, minor to moderate adverse effects without larger-scale fire restoration strategies.	Short-term effects would be adverse, and negligible to minor. Long-term effects would be moderate beneficial effects with restoration of natural fire. Cumulative effects would be negligible to minor adverse in the short-term, and minor to moderate beneficial in the long-term.
WILDLIFE	Short-term effects to wildlife would be minor, direct, adverse effects due to suppression actions, human presence, and unwanted fire effects. Long-term benefits would be expected from fires meeting resource objectives for habitat. Cumulative effects would be negligible to minor and adverse. Trans-boundary effects would be beneficial and minor to moderate.	Short-term effects would be minor, direct, and adverse. Long-term effects would be moderate, indirect beneficial effects due to restoration of fire to park habitats. Cumulative effects would be minor to moderate, short-term adverse. Trans-boundary effects would be moderate and beneficial.
AESTHETICS/ **RECREATIONAL VALUES**	Short-term effects to aesthetics would be minor to moderate, direct and adverse. Long-term effects would include negligible adverse effects and minor to moderate beneficial effects. Short-term effects to recreational values would be minor to moderate, direct and adverse. Long-term effects would be minor and adverse. Cumulative effects on aesthetics and recreational values would be adverse and negligible to minor.	Short-term effects would be minor to moderate adverse effects from wildland fires that prompt restrictions and closures. Long-term effects would be minor to moderate and beneficial. Minor, beneficial cumulative effects would minimally offset the adverse effects from past actions with increasing visitor and recreational use.
CULTURAL RESOURCES **(Archaeological resources, Historical resources, Cultural landscapes)**	Short-term effects would be direct and indirect, negligible adverse effects. Long-term effects would be negligible to minor and beneficial. Cumulative effects would be negligible and adverse.	No measurable short or long-term adverse effects would occur for most fire operations. Minor to moderate long-term beneficial effects to cultural resources would occur as protection objectives are accomplished. Cumulative effects would be long-term, moderate and beneficial as fuels and vegetative communities are restored to historical levels.
ETHNOGRAPHIC RESOURCES	No adverse effects would occur short or long-term to ethnographic resources; appropriate consultation and avoidance measures would be taken. No long-term cumulative adverse effects are anticipated.	There would be no measurable short-term adverse effects. Long-term effects would be beneficial and minor to moderate, depending on scope of fire applications to meet resource objectives, including enhancement of native

IMPACT TOPIC	ALTERNATIVE A: NO ACTION	ALTERNATIVE B: PREFERRED
		vegetation. Cumulative effects would be minor to moderate, beneficial and long term.
PARK OPERATIONS	There would be short-term adverse impacts to park operations, and long-term minor to moderate adverse effects with a higher risk of damaging wildland fires. Cumulative effects would be minor and adverse.	There would be short-term, minor to moderate adverse impacts to park operations, and long-term, negligible to minor adverse effects. Cumulative effects would be minor, short-term and adverse.
PARK NEIGHBORS	Short-term impacts to park neighbors would be adverse, and negligible to moderate. Long-term effects would be beneficial and negligible to minor. Cumulative effects would be minor to moderate adverse effects on neighbors due to increasing human presence. Negligible adverse trans-boundary impacts would be expected.	Short-term impacts would be direct, adverse, and minor except for the most extreme burning conditions. Long-term effects would be negligible to moderate beneficial effects park-wide. Cumulative effects would be moderate, long-term, and beneficial. Trans-boundary effects would be beneficial and negligible to moderate as fuels are reduced along the boundary over the long-term.

AFFECTED ENVIRONMENT

This section describes the existing environment, or baseline conditions, that would be affected if any of the alternatives were implemented. Current resource descriptions and social and economic conditions are included under various impact topics identified from scoping. The best available scientific and monitoring data are used.

Air Quality

Glacier National Park is a designated mandatory Class I area under Section 162 (a) of the Clean Air Act. This means that air-quality-related values are to be maintained at the highest level under the law. According to the park's General Management Plan (GMP; NPS 1999a), baseline air quality is considered good in the park. Visibility is occasionally affected by airborne particulates including smoke from natural and prescribed fires, and more adversely affected during inversion conditions.

The park currently monitors particulates, visibility, acid deposition, dry deposition, ozone, and chemical concentrations through the following cooperative national and state programs.

- National Dry Deposition Network. (Measures gaseous pollutants and meteorological data).
- National Atmospheric Deposition Program/National Trends Network. (Measures acidity, conductivity, precipitation, chemical concentrations, and deposition anion and cation concentrations).

- Visibility Monitoring and Data Analysis Program/Interagency Monitoring of Protected Visual Environments (IMPROVE; measures visual range, air temperature, relative humidity; also collects fine particulates [PM-2.5])[2] of sulfate, nitrate, elemental carbon, soil, and coarse soil). Data are used by regional planning organizations to measure reasonable progress and set long-term goals for improvement of visibility in Class I areas both within and outside the state (NPS 1999b).

Wildland and prescribed fires have the potential to impact air-quality-related values in and around Glacier National Park. Emission amounts depend on the size and intensity of the fire and are determined largely by meteorological conditions (temperature, wind speed and direction at various heights), fuel type and moisture content, and composition of vegetation and fuel loading (mass of combustible materials expressed in tons per acre).

Under the Administrative Rules of Montana for air quality (Sections 17.8.804 and 17.8.825; MDEQ 1996) in Class I areas, maximum allowable increases in pollutant concentration (PM-10 particulate matter) over baseline concentration shall be limited to 8 $\mu g/m^3$, with an annual arithmetic mean of 4 $\mu g/m^3$. There are no established standards for particulates of 2.5 $\mu g/m^3$ to date; however, this minute-sized particulate can penetrate deep into the lungs and cause respiratory problems for firefighters and the public from extended exposure. Thus, there is the need for monitoring emissions from those prescribed fires and wildland fires managed for resource benefit where air-quality-related values may be affected beyond established standards, or to contribute data toward standards not yet established.

Natural Soundscapes

Human-generated noise in the park is predominantly from traffic, motorboats, scenic air tours, and maintenance and administrative activities. Visitor services near campgrounds, lodges, roads, and other developed areas often produce higher levels of noise. Natural areas are not always silent but include the sounds of running water, blowing wind, chattering birds, and many other sounds found in nature. Mechanical noises, such as those produced by aircraft, chainsaws or fire pumps can drown out these natural sounds on a temporary basis. The wilderness and backcountry areas of the Park are managed for natural quiet.

Threatened and Endangered Species and Species of Concern

According to the Endangered Species Act of 1973, the term "endangered species" means any species, which is in danger of extinction throughout all or a significant portion of its range. A "threatened species" is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. There are five threatened or endangered animal species listed by the U.S. Fish and Wildlife Service (USFWS) known to occur in Glacier National Park. They are the threatened bald eagle, grizzly bear, Canada lynx and bull trout, and the endangered gray wolf. Federally listed plant species include water howellia

[2]Particulate matter with an aerometric diameter equal to 2.5 microns or less.

and Spalding's campion, not known to exist in the park, and the candidate species slender moonwort, which does occur in the park.

Gray Wolf. In 1986 the first documented denning of wolves in the western United States in over 50 years occurred in Glacier (Ream et al. 1991). Wolves have continued to den in the park nearly every year since. Two separate wolf packs with a total of 10-33 wolves maintained home ranges in the North Fork throughout the 1990s. Recent sightings document two packs occupying the North Fork and a third pack in the Middle Fork area. The population dynamics of recolonizing wolves are extremely variable. Wolf monitoring activities in Glacier National Park have been reduced since wolf ecology research concluded in 1996.

Gray wolves are wide-ranging and their distribution is tied primarily to that of their principal prey (deer, elk, and moose). Key components of wolf habitat are: 1) a sufficient, year-round prey base of ungulates and alternate prey; 2) suitable and somewhat secluded denning and rendezvous sites; and 3) sufficient space with minimal exposure to humans (USFWS 1987). Low elevation river bottoms that are relatively free from human influence provide important winter range for ungulates and wolves. Wolves are especially sensitive to disturbance from humans at den and rendezvous sites during the breeding period. Human activity near den sites can lead to pack displacement or physiological stress perhaps resulting in reproductive failure or pup mortality (Mech et al. 1991). Indirectly, wolves support a wide variety of other species; common ravens, coyotes, wolverines, mountain lions and bears feed on the remains of animals killed by wolves. Bald and golden eagles routinely feed on the carcasses of animals killed by wolves during the winter. As apex predators, wolves also help regulate the populations of their prey ensuring healthy ecosystems and greater biodiversity (Terborgh 1988).

In addition to the resident North Fork and Middle Fork packs, wolves have been reported in every major drainage in the park in recent years including the Many Glacier, McDonald, Cut Bank, St. Mary, Belly River, and Two Medicine Valleys (NPS files). Wolves denned in 1993 and 1994 in the Belly River area in Alberta, but there has been no verified denning activity east of the Continental Divide in Glacier National Park. Recent sightings and historic records for the east side of the park suggest that wolves are in the process of recolonizing the area. Pack activity has recently been observed in the St. Mary, Many Glacier and Belly River Valleys.

Bald Eagle. Bald eagles use portions of Glacier National Park on a year-round basis as nesting and wintering residents (Yates 1989), and as seasonal migrants (McClelland et al. 1982, Yates et al. 2001). There are 11 known bald eagle breeding areas in the park, including five in the North Fork Valley, two in the Goat Haunt-Belly River area, one in the Middle Fork Valley, one at Lake McDonald, one at Saint Mary Lake, and one in the Two Medicine Valley. There is another nest within 5 kilometers of the western park boundary in the North Fork Valley, and it is likely that these eagles forage inside the park as well. Documented spring and summer eagle activity in the Many Glacier Valley indicates that there may be other resident bald eagles nesting near Sherburne Reservoir (NPS files). Glacier National Park is within a major bald eagle migration corridor (McClelland et al. 1996, Yates et al. 2001). Some eagles remain to forage near Lake McDonald and winter in the area, especially along the Middle and North Forks of the Flathead River.

Productivity of Glacier's nesting bald eagle population is considered low and is generally less

than half that of the productivity documented for the rest of Montana (GNP 1999). Glacier's productivity is also about half of that recommended in the *Pacific States Bald Eagle Recovery Plan* (USFWS 1986) for maintaining viable populations of nesting bald eagles. Reasons for lower productivity in the park may include severe winter and spring weather, deterioration of native fisheries (prey species), and human disturbance near nest and forage sites.

Nesting habitat characteristics include old-growth forest types near water, where eagles are afforded some seclusion from human activity. Many nest-sites are located near lake inlets, where foraging for fish is productive. Vegetative screening provides much of the necessary seclusion for eagles near nest, roost, forage, and feeding areas (Caton et al. 1992). Bald eagle nesting sites occur primarily along the margins of lakes and along the larger rivers in the park. Nest areas are critical, and human activity or development may stimulate abandonment of the breeding area, affect successful completion of the nesting cycle, and reduce productivity. Designated nest areas extend within a 0.25-mile (400 m) radius of all nest sites that have been active within 5 years. The objectives of designating nest-site areas are to minimize human disturbance and to maintain or enhance nest-site habitat suitability.

Grizzly Bear. Glacier National Park is part of the Northern Continental Divide Ecosystem (NCDE) recovery area for the threatened grizzly bear. Population estimates for this ecosystem vary between 549-813 bears (USFWS 1993). The NCDE adjoins grizzly bear habitat in Canada. The number of grizzly bears inhabiting Glacier National Park is estimated at approximately 212 based on preliminary results from a recent study using sign surveys and DNA fingerprinting (USGS 2002). Exact population estimates and trends are difficult to establish due to the lack of intensive population level research within the park and the inherent problems of counting the widely distributed and reclusive grizzly bear. The *Grizzly Bear Recovery Plan* (USFWS 1993) and the *Glacier National Park Bear Management Plan* (GNP 2001) serve as guidelines for management of grizzly bears in Glacier National Park. The plans outline actions that are required to protect and recover the federally listed grizzly bear.

Grizzly bear habitat is found throughout the park and ranges from the lowest valley bottoms to the summits of the highest peaks. Grizzly bears require large areas of undeveloped habitat (including a mixture of forests, moist meadows, grasslands, and riparian habitats) and have home ranges of 130 to 1,300 square kilometers (Claar et al. 1999). A radio-collared female grizzly, with cubs, was documented using 220 square kilometers as a home range in 1998 and 1999 in the McDonald Valley of Glacier National Park (NPS files). Grizzly bear seasonal movements and habitat use are tied to the availability of different food sources. In spring, grizzly bears feed on dead ungulates and early greening herbaceous vegetation at lower elevations (Martinka 1972). During the summer, some bears move to higher elevations in search of glacier lilies and other roots, berries, and army cutworm moths (*Euxoa auxiliaris*). During the huckleberry (*Vaccinium* sp.) season (late summer and fall), bears often concentrate in the Apgar Mountains, Belton Hills, Snyder Ridge, the Many Glacier Valley, the Two Medicine Valley, and other areas. Avalanche chutes provide an important source of herbaceous forage for grizzly bears in the early summer and fall (Rockwell 1995).

During the winter, grizzly bears hibernate in dens away from human disturbance, typically at higher elevations on steep slopes where wind and topography cause an accumulation of deep snow. The denning season in the western portion of the NCDE usually begins in early October,

and females may linger near dens until late May (Mace and Waller 1997). Den entry in the Swan Mountains occurred from mid October to mid December.

In addition to diverse foraging habitat, grizzly bears require natural habitat that provides connectivity, or travel corridors, between foraging sites. Examples of these types of travel corridors are found at the foot and head of lakes in the McDonald, Two Medicine, and Many Glacier Valleys. Grizzlies also require a substantial amount of solitude from human interactions (USFWS 1993).

Grizzly bear/human interaction is a management concern that can threaten the safety of visitors as well as that of bears. Bears that are familiar with humans have the potential to become habituated to human presence, leading to further habituation and increased potential for bear/human encounters. Habituated bears are at greater risk of becoming food-conditioned and may aggressively seek human food. Habituated bears are usually relocated or hazed from developed areas, and food-conditioned bears are oftentimes removed from the population. Bears not habituated to humans are likely displaced from foraging areas and travel routes in proximity to hiking trails and developed areas. Helicopter flights have the potential to disturb and displace bears even in park areas without trails.

Glacier National Park was placed into grizzly bear management situations in accordance with the Grizzly Bear Recovery Plan (USFWS 1993). Over 1 million acres of the park (proposed wilderness) are established as Management Situation 1, in which management decisions will favor the needs of the grizzly bear when grizzly habitat and other land-use values compete, and grizzly-human conflicts will be resolved in favor of grizzlies, unless a bear is determined to be a nuisance. Maintenance and improvement of grizzly bear habitat and grizzly-human conflict minimization will receive the highest management priority in these areas. The remainder of the park, which is developed front-country, is established as Management Situation 3, in which grizzly habitat maintenance and improvement are not the highest management considerations, grizzly bear presence will be actively discouraged, and any grizzly involved in a grizzly-human conflict will be controlled. Glacier National Park is encompassed by 5 Bear Management Units (BMUs) and 41 internal Bear Management Zones (BMZs).

Canada Lynx. In April, 2000, Canada lynx was listed as a threatened species in the coterminous United States. The U.S. Fish and Wildlife Service concluded that the population was threatened by human alteration of forests, low numbers as a result of past overexploitation, expansion of the range of competitors, and elevated levels of human access into lynx habitat. To date, critical habitat for the species has not been designated or proposed (USDA, USDI 2000).

Historically, lynx were common throughout the area of Glacier National Park, but documented sightings have declined since the late 1960s (NPS files). Systematic lynx surveys involving snow tracking and DNA sampling were initiated in 1994 and 1999 respectively; lynx were detected in many drainages throughout the park including the St. Mary, Two Medicine, McDonald and Many Glacier Valleys although no estimates of population numbers were made. Winter snow track surveys in 2002 detected lynx at Park Creek, Soldier Pass and Scalplock Mountain. In addition, remote camera stations and winter tracking have provided documentation of family groups in the Many Glacier and Two Medicine Valleys.

Lynx habitat generally is described as climax boreal forest with a dense undercover of thickets and windfalls (Ruediger et al. 2000). Advanced successional stages of forests and dense conifer

stands often are preferred habitats of lynx for denning and foraging respectively. Large amounts of woody debris and minimal human disturbance are important features of denning sites. Lynx generally forage in young conifer forests especially where their primary prey, snowshoe hare (*Lepus americanus*), is abundant. Travel corridors are thought to be an important factor in lynx habitat because of their large and variable home ranges, generally 8-738 square kilometers (Ruediger et al. 2000). Travel cover includes contiguous vegetation cover over 2 meters tall, and lynx generally do not cross openings greater than 100 meters wide (Koehler 1990). Lynx are most susceptible to disturbance during the denning period and while newborns are developing (May–August; Claar et. al. 1999).

Concurrent with the listing process, a national interagency Canada Lynx Conservation Assessment and Strategy was developed to provide a consistent and effective approach to conservation of the species. All federal land management agencies, including the National Park Service, were participants. The Canada Lynx Conservation Assessment and Strategy identifies 17 risk factors that could adversely affect lynx mortality, productivity and movements (Ruediger et al. 2000). Within Glacier National Park, the primary risk factors for lynx are: wildland fire management policies that preclude natural disturbance processes, roads and highways, winter recreational trails, habitat degradation by non-native invasive plant species, incidental or illegal shooting and trapping, competition or predation as influenced by human activities, and human developments that degrade and fragment lynx habitat.

The U.S. Forest Service and U.S. Bureau of Land Management have entered into conservation agreements with the U.S. Fish and Wildlife Service to consider conservation measures in the Canada Lynx Conservation Assessment and Strategy when designing and implementing activities that might affect lynx or their habitat (Ruediger et al. 2000). The National Park Service is currently in the process of crafting a Conservation Agreement for Canada Lynx with the U.S. Fish and Wildlife Service. Potential lynx habitat has not been delineated in Glacier National Park due to inadequate vegetation and snow cover information. Approximately 55% of Glacier National Park is covered by deciduous and coniferous forests, but an unknown percentage of forested habitats qualify as potential Canada lynx habitat (GNP files). Although the National Park Service has not yet signed the Conservation Agreement for the Canada Lynx, Glacier National Park considers the recommendations in the Canada Lynx Conservation Assessment and Strategy (Reudiger et al. 2000) prior to undertaking any new activities in lynx habitat.

Bull Trout. The U.S. Fish and Wildlife Service has accorded bull trout in both the Upper Columbia River Basin and the Hudson Bay drainage "threatened" status under the provisions of the Endangered Species Act. Glacier National Park supports lake and stream habitat for bull trout in the North Fork and Middle Fork of the Flathead River drainages and portions of the Hudson Bay drainage. River and lake systems in the Missouri River drainage within Glacier National Park do not contain bull trout. Historic information on bull trout in east side streams and lakes is mostly anecdotal, making an assessment of population status and trend a future priority. Ongoing bull trout studies by both Canadian and U.S. partners are adding to our knowledge of this federally listed species.

Slender Moonwort. A Candidate species, the slender moonwort, is ranked by Montana Natural Heritage Program (MNHP) as a G1/S1 species, meaning that both on a global and state level, this plant is "critically imperiled because of extreme rarity (five or fewer occurrences or very few remaining individuals) or because of some factor of its biology making it especially vulnerable to

extinction." Slender moonwort grows in open meadows, under trees, roadside ditches, and on limestone cliffs at higher elevations. It has been found in early successional habitats in the Many Glacier and Chief Mountain Road areas.

State Listed Species of Concern. Species of concern to Glacier National Park are those species that are rare, endemic, disjunct, vulnerable to extirpation, in need of further research, or likely to become threatened or endangered if limiting factors are not reversed. Likewise, a species may be of concern because of characteristics that make them particularly sensitive to human activities or natural events. The Species of Concern list for Glacier National Park includes species that are listed as "Species of Special Concern" by the Montana Natural Heritage Program (MNHP), "Priority Species" by Partners in Flight, and "Sensitive Species" by the USFS (Appendix D). In addition, species of concern may also include big game, upland game birds, waterfowl, carnivores, predators and furbearers whose populations are protected in the park but subject to hunting and trapping outside of the park. Plant species of special concern are listed in Appendix D. There are 58 animal species of concern in Glacier National Park, including the following:

> Swift fox, olive-sided flycatcher, red-eyed vireo, Brewer's sparrow, LeConte's sparrow, boreal owl, black-backed woodpecker, northern bog lemming, pileated woodpecker, northern hawk-owl, ferruginous hawk, American white pelican, loggerhead shrike, white-tailed ptarmigan, brown creeper, Clark's nutcracker, horned grebe, Barrow's goldeneye, long-billed curlew, Vaux's swift, calliope hummingbird, Lewis's woodpecker, willow flycatcher, Hammond's flycatcher, winter wren, veery, and lazuli bunting, black tern, Forster's tern, Caspian tern, Franklin's gull, black-crowned night heron, cordilleran flycatcher, fisher, wolverine, Rocky Mountain bighorn sheep, silver-haired bat, great gray owl, peregrine falcon, prairie falcon, northern goshawk, golden eagle, blackswift, ruffed grouse, three-toed woodpecker, harlequin duck, common loon, trumpeter swan, common tern, Barrow's goldeneye, and hooded merganser, osprey, Williamson's sapsucker, lark bunting, McCown's longspur, chestnut-collared longspur, and Boreal chickadee.

The state of Montana lists the following aquatic species found in Glacier National Park as "species of special concern":

> Westslope cutthroat trout, Yellowstone cutthroat trout, Montana arctic grayling, shorthead sculpin, spoonhead sculpin, trout-perch, Rocky Mountain capshell.

Of those listed, both the Yellowstone cutthroat trout and the Montana arctic grayling are not native to Glacier National Park but were transplanted in the park to improve sport fishing opportunities (NPS files)**.**

Snags are important habitat requirements for the following species of concern: silver-haired bat, great grey owl, boreal owl, pileated woodpecker, and northern hawk-owl (Appendix D).

Soils

Soils in Glacier National Park reflect a variety of parent materials and carry a range of ratings (low to high) related to productivity. The ability of soils to support and/or re-establish vegetation depends on nutrient- and water-holding capacity. Most are very susceptible to invasion by weeds when disturbed and have a low to moderate erosion potential depending on sand content (NPS 1999a).

For example, the soils in the St. Mary developed area have a moderate to high potential for revegetation and productivity in the upper layers; this decreases in the deeper layers because of increased rock content and low water-holding ability. With good drainage, these soils are also susceptible to weed invasion when disturbed.

Soils on the west side of Logan Pass are identified as alluvial, glacier till, and bedrock limestone. In the Apgar area, the soils are identified as floodplain, cobbled alluvial, sandy, and silty over cobbled alluvial. They have a low to moderate erosion potential, depending on sand content.

Vegetation

The park represents a convergence of species representing four major floristic provinces. Contributing influences for this diversity include the contrast between the climates of the east and west sides of the Continental Divide, sharp topographic relief, and variability in soils characteristics. Over 1,132 vascular plant species have been recorded (Lesica 2002). Of these, 67 are rare in Montana (Appendix D).

Table 3. Vegetative land cover types in Glacier National Park.

Vegetative Land Cover Type	***Area (Acres)***
Dry Herbaceous (plants and shrubs growing in dry areas)	77,067
Mesic Herbaceous (plants and shrubs growing in wet areas)	48,821
Deciduous Trees and Shrubs	64,924
Coniferous Forests and Dense Mesic	334,943
Coniferous Forest and Open Dry Areas	160,744
Barren Rock, Snow, and Ice	298,357
TOTAL	984,856

The major vegetative community types in these land cover types consist of grasslands (dry herbaceous), pine or woodland savannahs (open, dry coniferous and deciduous), bottomland forests (mesic herbaceous and deciduous), ponderosa pine/Douglas fir forests (open, dry coniferous), western red cedar/western hemlock forests (dense, mesic coniferous), spruce/fir forests (dense, mesic coniferous), and alpine communities (mesic herbaceous and barren). Also included are marshes, swamps, lakes, and barren, rocky talus slopes (Habeck 1970b).

Forests cover two-thirds of Glacier National Park's land area. Lodgepole pine is widespread at lower and intermediate elevations, together with western larch and some western white pine on the west side of the park. The Lake McDonald area supports western red cedar and western

hemlock, with spruce, Douglas-fir, and subalpine fir also occurring on the west side. Ponderosa pine occurs near Polebridge.

Near the eastern park boundary, lodgepole pine intergrades with a mix of prairie community, aspen groves, limber pine, and Douglas fir. This area is prime habitat for elk, deer, and other wildlife species (Finklin 1986).

The integrity of the park's plant communities remains largely intact. However, some communities have been affected by human activities, such as introductions of exotic species, resource extraction, land development, and fire exclusion.

As an example of altered communities, in 1992, two prescribed fires were ignited in the prairies of the North Fork, areas that had not burned in over 60 years in a known historical (anthropogenic burning by native cultures) fire regime of about 20 years. The unnatural absence of fire has allowed young lodgepole pines to encroach on the meadows, beginning a succession to a forest community that would not occur under a natural fire regime. In Round Prairie in particular, sagebrush has begun to dominate the meadow, changing the species composition of the community from what it would have been under a historical 20-year cycle (Schmidt 1993).

Grassland communities include the fescue-wheatgrass prairie, which is dominated by rough fescue and other grasses. East-side prairie landscape is dominated primarily by Idaho fescue, with introduced timothy and brome.

Pine or woodland savannahs include quaking aspen and black cottonwood groves, with open lodgepole pine, ponderosa pine, and limber pine stands. Limber pine is confined to the east side of the park and is afflicted with white pine blister rust. The five needle pines, white pine, limber pine, and whitebark pine are all suffering serious ecological effects as a result of fire exclusion and the exotic blister rust. Currently, 78% of the whitebark pine in Glacier is lethally infected with the rust and is likely to die within 15 years (Kendall and Keane 2001).

Ponderosa pine makes up a minor portion of total conifer stands in the park and is found only on the west side. It occupies the warmest and driest sites that support forests and grades into savanna communities. Douglas fir occupies slightly cooler, more mesic (moist) sites than ponderosa.

The western red cedar and western hemlock forests include nearly every species of tree that grows in the park. Both require shady conditions for seedling establishment.

Fire has been a major disturbance event that has provided for diversity of plant communities and wildlife habitat in many areas of the park. However, these natural fire regimes have changed, not only in response to climate but through fire suppression and elimination of the native cultural practice of igniting fires as well (Barrett 1993). In some vegetation communities, fire exclusion has altered historical age-class structures and the natural forest mosaic. As a result, some forests of mixed-severity fire regimes have been changed to high-severity, stand-replacement fire regimes.

A list of plant species of special concern is included as Appendix D, which also indicates those plants with only known occurrence in Glacier National Park within the state of Montana. A complete species list exists on the NPS inventory and monitoring (I&M) database found on the University of California at Davis website (http://ice.ucdavis.edu/nps/sbypark.html).

Exotic species. Organisms are considered exotic (alien, nonnative, introduced, nonindigenous) when they occur artificially in locations beyond their known historical natural ranges. These species can be brought in from other continents, regions, ecosystems, and even habitats.

Exotic plants that are determined to be major pests of agricultural ecosystems are designated as "noxious weeds" by states and counties. Exotic species pose adverse threats (OTA 1993) to natural ecosystems in ways such as

- reduction in biodiversity,
- loss of and encroachment upon endangered and threatened species and habitat,
- loss of habitat for native species,
- loss of food sources for wildlife,
- changes to natural ecological processes such as plant community succession,
- alterations to the frequency and intensity of natural fires, and
- disruption of native plant-animal associations such as pollination, seed dispersal, and host-plant relationships.

The flora of Glacier National Park also includes approximately 152 species of exotic plants (Lesica 2002), or 13% of the park's flora, that were introduced intentionally or accidentally. A number of these plants are increasing in area covered and density, threatening native plant communities.

The Montana Department of Agriculture maintains a list of noxious weeds, which are exotic plant species established or potentially established in the state, which may render land unfit for forestry wildlife or other beneficial uses. Noxious weed infestations have been documented in the following areas of the park.

There are approximately 95 acres of noxious weed invasion in the Many Glacier area (GNP exotic database, 2001). Weeds in this area include spotted knapweed, oxeye daisy, Canada thistle, houndstongue, sulfur cinquefoil, leafy spurge, Dalmatian toadflax, and meadow buttercup. Most of this acreage is along the Many Glacier Road, and near the Many Glacier Hotel, Swiftcurrent concession area, and campground.

Within the McDonald Valley (including the Camas Road), there are 245 acres of infestation by state-listed noxious weeds (GNP exotic database, 2001). These include spotted knapweed, oxeye daisy, Canada thistle, houndstongue, leafy spurge, orange hawkweed, St. Johnswort, Dalmatian toadflax, sulfur cinquefoil, and common tansy. Of these acres, 97 or 40%, are within the backcountry.

There are 310 acres of noxious weed infestation within the St. Mary Valley, the highest level of any area within the park. Most of this infestation is within the front country along the Going-to-

the-Sun Road, within development areas, and within the fescue grasslands adjacent to the road. Only 4 acres, or <1%, is within the backcountry zone. Weeds in the St. Mary Valley include spotted knapweed, oxeye daisy, Canada thistle, houndstongue, St. Johnswort, orange hawkweed, leafy spurge, and common tansy.

There are approximately 30 acres of noxious weed invasion in the Two Medicine Valley (GNP exotic database, 2001). These species include spotted knapweed, oxeye daisy, Canada thistle, houndstongue, Dalmatian toadflax, sulfur cinquefoil, and common tansy. Only spotted knapweed, oxeye daisy, and Canada thistle have moved into the backcountry to invade approximately 1 acre, or >1%.

Within the Middle Fork, there are 399 acres of noxious weed infestation (GNP exotic database, 2001). State-listed noxious weeds include spotted knapweed, oxeye daisy, Canada thistle, orange hawkweed, St. Johnswort, and sulfur cinquefoil. Nearly 387 acres, or 97%, are within the backcountry.

There are approximately 119 acres of noxious weed infestations in the North Fork Valley (GNP exotic database, 2001). State-listed noxious weeds include spotted knapweed, oxeye daisy, Canada thistle, houndstongue, leafy spurge, orange hawkweed, St. Johnswort, sulfur cinquefoil, and common tansy. Twelve acres, or 10%, are within the backcountry.

There are approximately 20 acres of noxious weed infestation in the Goat Haunt-Belly River Valleys (GNP exotic database, 2001). State-listed noxious weeds include spotted knapweed, oxeye daisy, Canada thistle, orange hawkweed, and sulfur cinquefoil. Almost 12 acres, or 60%, are within the backcountry.

Because the perpetuation of native species is beginning to be inhibited by these plants, adverse effects to wildlife are increasing in some cases. Scenic quality, recreational enjoyment, and ecological values also are directly affected (NPS 1999a). Exotics occur in disturbed areas such as roadsides, construction projects, old homesteads, grazed fields, trails, burns, floodplains, and utility sites. Spread occurs when visitors, construction equipment, animals, wind, and water transport seeds. Particular issues are addressed in the park's *Exotic Vegetation Management Plan*.

Invading noxious weeds are an adverse threat to native grasslands in the park. Unfortunately, ground disturbance such as fire tends to create a receptive seedbed where fire has removed competing vegetation, thereby making spread of noxious weeds more likely. This has direct effects on wildlife and recreational enjoyment.

Water and Aquatic Resources

Water from the park east of the Continental Divide flows either into the Hudson Bay (via the Saskatchewan River drainage) or Gulf of Mexico (via the Missouri River drainage). West of the Divide, water flows into the Columbia River drainage and on into the Pacific Ocean.

In 1976, Congress designated the three forks of the Flathead River as part of the National Wild and Scenic River system. The North Fork of the Flathead River is designated "scenic" from the international boundary downstream to Camas Creek and "recreational" from Camas Creek to the confluence with the Middle Fork. The Middle Fork is designated "recreational" for the entire length bordering Glacier National Park. Congress directed that the U.S. Forest Service be the primary management agency for the Flathead Wild and Scenic River and that the National Park Service would have secondary responsibility. Management of the North and Middle Forks as wild and scenic rivers helps to protect the natural, cultural, scenic, and recreational values of the park (NPS 1999a).

Water quality in Glacier National Park is high. Studies have determined that surveyed lakes in the park were low to very low in nutrients and productivity because of the low amounts of phosphorus present. There are currently 17 native and 7 nonnative species of fish occupying park waters.

In addition to the fishes in the park's lakes and streams, Glacier supports habitats for salamanders, frogs, and aquatic macro-invertebrates. Six amphibians have been identified in the park, including the Columbia spotted frog (*Rana luteiventris*), pacific tree frog (*Pseudacris regilla*), long-toed salamander (*Ambystoma macrodactylum*), chorus frog (*Pseudacris maculata*), and the state listed species of concern, boreal toad (*Bufo boreas*), and tailed frog (*Ascaphus montanus*).

In 1994, the State of Montana signed a water rights compact with the federal government that described reserved water rights for NPS units including Glacier National Park. Included in the compact is a requirement to report surface water used for activities such as fire suppression.

Wetlands

The National Wetlands Inventory mapping indicates there are 4639 known non-riverine wetlands larger than 5 acres and 1430 known riverine wetlands in the park. Together, the area totals 37,848 acres.

Wetlands and watershed dynamics in Glacier National Park are closely tied. Changes in vegetative cover on slopes and near wetland areas directly affect runoff, streamflows, and eventually wetland hydrology.

Wilderness

The 1964 Wilderness Act (16 USC 1131 *et seq.*) provides for protection of wilderness for future generations. Because most of the backcountry of Glacier National Park is proposed wilderness, it is managed as designated wilderness in accordance with NPS policy (NPS 1999c).

Management of natural resources in the backcountry zone will focus on protection and restoration of resources and natural processes. It will offer the visitor outstanding opportunities for solitude and natural quiet. Natural processes will prevail (NPS 1999a).

Backcountry camping attracts park users. Glacier's trail system links approximately 60 backcountry campgrounds, and in 1996 approximately 5,000 backcountry permits were issued.

The role of fire as a natural process in wilderness has been well documented. The 1963 Leopold Report in particular pointed to the need to restore natural fire to areas managed as natural parks and wilderness. This landmark document provided impetus for the transition of wilderness management away from object preservation to the inclusion of the natural disturbance processes that create and influence ecosystem structure.

Wildlife

Glacier National Park provides habitat for 261 bird species, 63 mammal species, and 172 aquatic species over a vast wildland that encompasses over 1 million acres. Except for bison and caribou, the park's fauna is complete and virtually unchanged from prehistoric times. Wildfire is a natural part of this landscape and affects its wildlife in complex ways that are not completely understood. In fact, the interactions between wildfire and wildlife are one of the least studied topics in ecology. A long-held belief is that wildfire generally favors those species considered game animals. Native peoples frequently ignited fires in what is now Glacier National Park to benefit species such as deer, elk, and moose (Barrett and Arno 1982). Research has confirmed that plant species used as forage by ungulates often respond favorably to burning (Clark and Starkey 1990, Schwartz and Franzmann 1989). However, the positive results of burning depend upon an interacting array of other variables including slope, aspect, soil moisture, plant species composition, fire frequency, fire intensity, the patchiness of the postburn plant community, and the presence of other herbivores and predators (McMahon and deCalesta 1990, Clark and Starkey 1990, Schwartz and Franzmann 1989, Peek et al. 1985). Wildlife communities are generally more diverse when the vegetation represents a mosaic of seral stages (Clark and Starkey 1990).

Large predators that prey on ungulates, such as coyotes, wolves, mountain lions, and bears, may benefit from higher prey densities due to the presence of early seral-stage forest patches. Fires in Yellowstone National Park killed a large number of ungulates, and grizzly bears benefitted from the increase in availability of carcasses (Blanchard and Knight 1990). Additionally, bears may benefit from the availability of productive fruit-bearing shrubfields created by wildfire (Martin 1979, Zager 1980). However, both predator and prey populations may oscillate depending on the spatial arrangement of seral-stage mosaics. The primary prey of lynx is snowshoe hare, which tend to be most numerous in early seral-stage forests, but also require mature forest for denning areas (Koehler and Brittell 1990). A mosaic of forest types appears to distinguish good lynx habitat (Ruggiero et al. 2000).

Conversely, other species may be negatively affected by wildfire. Those species dependent upon late seral-stage or old-growth forests will obviously be impaired if their habitat is converted to an earlier seral-stage. An important facet of old-growth forests is the presence of downed wood, or coarse woody debris (CWD). CWD provides foraging and denning habitat for many species of insects and small mammals and their predators. Species potentially negatively influenced by

wildfire include carpenter ants, long-toed salamander, and marten. Diminished diversity of small mammal fauna may negatively influence the population of their predators including raptors and owls (Tiedemann et al. 2000).

Exotic species. Known exotic or nonnative terrestrial and avian species include the raccoon, ring-necked pheasant, turkey, rock dove, European starling, and house sparrow. Another species that was not present when the park was established is the barred owl. A third species that has experienced a range expansion in the last century is the brown-headed cowbird, which has been observed throughout western portions of the park (NPS files).

Management of exotic animal species is undertaken wherever such species have a substantial impact on park resources or human health and when there is a reasonable expectation that these species can be controlled. None of the above-mentioned species is widespread or abundant, and control actions have not been implemented in the park.

Aesthetics/Recreational Values

The value of scenic resources is an aesthetic and recreational value. Discussed under Air Quality above, the Clean Air Act gives the Park Superintendent an affirmative responsibility to protect air-quality-related values such as scenery, including changes in how landscapes look from recent burns. In the backcountry zone, where restoration of natural processes is priority, burn areas of various ages are integral to this desired condition.

Similarly, the park is responsible for conserving aesthetic features in and around values to be protected pursuant to hazard fuels reduction activities.

In recent years, annual park visitation has ranged between 1.7 and 1.8 million visitors (NPS 1999a). The overall trend is increasing. A 1991 survey of visitors determined that of those contacted, 65% came to Glacier to view scenery and wildlife; 18% were looking for recreational opportunities such as hiking, biking, and fishing; and 11% were passing through to another destination.

July and August have the highest visitation; December, January, and February have the lowest visitation. The park maintains over 1000 campsites in 13 drive-in campgrounds, and 63 backcountry campgrounds are available with over 28,000 user nights recorded in 2001. Backcountry use follows general park trends, with the highest levels of use in July and August. Glacier Route Seven, the inside North Fork Road, is used to access many areas of the North Fork, including hiking/backpacking trails, fishing areas, and the Quartz and Logging Creek campgrounds.

Cultural Resources

The area now known as Glacier National Park has been settled and occupied for the last 10,000 years by tribal ancestors of the Pikuni (Blackfeet), Cree, Kootenai, Gros Ventre, Stony (Assiniboine), Crow, and Salish.

Field studies in the park have documented over 400 archaeological sites. The sites consist of camps, sites associated with fishing and hunting, religious sites, and a quarry. There are also historic archaeological sites associated with homesteads, roads, trails, and chalets.

The park landscape includes early historical features such as homesteads sites; remains of timber, mining and energy exploration and development; and early park administrative and concessions structures and facilities as well as trails and road systems. National Register listings have been completed for 357 park structures of which 6 are National Historic Landmarks. There are a variety of other properties that the Montana State Historic Preservation Officer and the park have mutually agreed are eligible for the National Register and currently are managed as if they were listed.

Many backcountry zone facilities in the park are designated historic. Trails from Two Medicine to the former Cutbank Chalets site and from the Cutbank Chalets site to Triple Divide Pass in Two Medicine's backcountry are historic trails listed on the National Register of Historic Places.

Within the Middle Fork backcountry zone there is one historic district and several historic patrol cabins and fire lookouts. The Nyack Ranger Station Historic District contains the ranger station barn and fire cache. Fielding Snowshoe Cabin, Upper Nyack Snowshoe Cabin, Lower Nyack Snowshoe Cabin, Upper Park Creek Patrol Cabin, Lower Park Creek Patrol Cabin, Harrison Lake Patrol Cabin, Coal Creek Cabin, and Lincoln Creek Patrol Cabin, as well as the Loneman and Scalplock Mountain Lookouts, are dispersed throughout the backcountry. Gunsight Pass Shelter and Logan Creek Patrol Cabin, as well as Mt. Brown, Swiftcurrent, and Heaven's Peak Lookouts, are scattered throughout the Going-to-the-Sun Road Corridor's backcountry. One historic district, various patrol cabins and fire lookouts, and an historic phone line are located in the North Fork's backcountry zone.

The park's GMP/EIS refers to several features considered as cultural landscapes. "Cultural landscapes" are features that not only include human-made features but also the natural context in which these features occur. Thus, the full range of natural/cultural values can be better understood and managed by the park. One such landscape has been evaluated formally and documented, the Going-to-the-Sun Road and surrounding landscape.

Ethnographic Resources

Ethnographic resources are defined as sites, structures, objects, landscapes, or natural resource features assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it (NPS 2001h).

To ensure that the NPS avoids adversely affecting the integrity of ethnographic resources during fire management program activities, the following current laws and policies will be complied with: Executive Order 13007 on American Indian Sacred Sites, NPS Management Policies, American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations, 36 CFR 8000, and Presidential Memorandum of April 29, 1994, on Government-to-Government Relations with Tribal Governments.

The Blackfeet, Kootenai and Salish Indian Tribes, have a long-standing traditional association with the Glacier National Park area. They have frequented the region hunting and camping; gathering plants and other resources for food, medicine, and spiritual purposes; and carrying out religious ceremonies. Through literature and Native American elder consultation, the park is beginning to document the fundamental significance of the region to traditional religion.

Two Medicine Lake, Running Eagle Falls, and Chief Mountain are among a few of the natural features holding religious significance. Certain rocks, minerals, animal parts, and plants played an important role in traditional culture.

Certain plants growing in the park are used in ceremonies and healing, and places where they grow are sometimes considered sacred, as are areas where ceremonies were once performed. Certain animals and their totems are also believed to possess spiritual qualities.

Park Operations

The Superintendent of Glacier National Park is ultimately responsible for the total management and protection of the park, including programs, the staff, facilities, and residents, as well as relationships with groups, agencies, and the general public who are interested in the park's future.

Fires occasionally disrupt routine park operations, particularly when developed areas and other values are threatened from unplanned, unwanted wildland fires. It is also recognized that planned fire management activities that meet objectives stated in an approved Fire Management Plan come with risks and concerns from residents and other park functions (maintenance, protection, interpretation, etc).

Park Neighbors

Glacier National Park shares most of the western and southern boundaries with the Flathead National Forest. The Lewis and Clark National Forests, the Blackfeet Indian Reservation, state of Montana lands, private in-holdings totaling 418.68 acres, adjacent private lands, and the Burlington Northern Santa Fe Railroad right of way also border the park. The park shares its northern boundary in British Columbia with a private landowner, a provincial forest reserve, and Akamina-Kishinena Provincial Park. In Alberta, the boundary is shared with Waterton Lakes National Park, the Blood Indian Reserve, and a provincial forestry/grazing reserve.

Most private inholdings in the park are small tracts, but a few are over 50 acres. All of the private land within the park is in either the Going-to-the-Sun Road Corridor or the North Fork area.

With the increasing opportunities for management of wildland fires under the 2001 Federal Wildland Fire Management Policy, preparation of a joint Fire Management Plan is perceived as both timely and beneficial to Glacier National Park and Flathead National Forest.

Responsibilities to international park neighbors are shared through the International Peace Park designation. The two national parks and the natural resources they share offer an opportunity to promote stewardship through mutual planning and information exchange. However, resource impacts that may become issues for both parks include management of natural fires, endangered species and wildlife, air quality, increasing visitation, and so on. Waterton Lakes National Park recently completed a Fire Management Plan that would provide for meeting the objectives of protection of the townsite and associated values and for desired fire effects such as grassland restoration and maintenance through the use of prescribed fire.

ENVIRONMENTAL CONSEQUENCES

This section presents the beneficial and adverse environmental effects of each alternative on the identified impact topic in comparative form, providing a clear basis for choice among the options.

All available information on known natural resources was compiled. Predictions about direct and indirect impacts are based on previous studies, monitoring completed, and wildland and prescribed fires that have occurred in the park, and the expertise and judgment of resource specialists.

Methodology for Assessing Impacts

Potential impacts are described in terms of **type** (are the effects beneficial or adverse?), **context** (are the effects site-specific, local, or regional?), **duration** (are the effects short-term or long-term?), and **intensity** (are the effects negligible, minor, moderate, or major, or would the effects constitute impairment of the park's resources and values?).

Cultural Resources: Impacts to all archaeological and historic resources are described in terms of type, context, duration, and intensity, which is consistent with the regulations of the Council on Environmental Quality (CEQ) that implement the National Environmental Policy Act (NEPA). Analysis under Section 106 of the National Historic Preservation Act (NHPA) is also included.

In accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 of the NHPA (36 CFR Part 800, *Protection of Historic Properties*), impacts to archeological resources and the cultural landscape were identified and evaluated by (1) deter

mining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the National Register of Historic Places; (3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the National Register; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

Table 4. Impact Topic Threshold Definitions.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Air Quality	Impact barely detectable and not measurable; if detected, would have slight effects.	Impact measurable (36 hours or less) and localized.	Changes in air quality would be measurable and would have consequences, but local effects (for 36 hrs of more).	Changes in air quality measurable, would have substantial consequences, and noticed regionally.	Short-term – Effects extend only through the duration of the proposed project Long-term – Effects extend beyond the period of the proposed project
Natural Soundscapes	There would be no introductions of artificial noise into the park.	A short-term introduction of artificial noise would occur at localized sites. The effect would be readily detectable, but would not adversely affect park visitors or wildlife.	A widespread or localized introduction of noise that would be readily detectable and would adversely affect nearby visitors and wildlife.	A long-term introduction of noise would occur that would adversely affect visitors and wildlife.	Short-term – Effects extend only through the duration of the proposed project Long-term – Effects extend beyond the period of the proposed project
Threatened and Endangered Species & Species of Concern	Listed species would not be affected or change so small as to not be of any measurable or perceptible consequence to the individual or its population. Equates to USFWS determination of "no effect".	There would be an effect on one or more individuals of a listed species or its habitat, but change would be small and short-term. Equates to USFWS "*may affect"* determination and would be accompanied by a statement of "*likely*" or "*not likely to adversely affect*" the species.	A noticeable, measurable affect to an individual or population of a listed species. The effect would have consequence to the individual, population, or habitat. Equates to USFWS "*may affect*" determination and accompanied by a statement of "*likely*" or "*not likely to adversely affect*" the species.	Noticeable, measurable affect with severe consequences or exceptional benefit to the individual, population, or habitat of a listed species. Equates to USFWS "*may affect*" determination and accompanied by a statement of "*likely*" or "*not likely to adversely affect*" the species.	Short-term – plants and animals recover in less than 1 year Long-term – Takes more than 1 year for plants and animals to recover

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Soils	Impacts would be below detectable levels and not measurable.	Changes to character of soils detectable and localized.	Changes to character of soils readily apparent over a wide area.	Impacts to soils characteristics severe or of exceptional benefit over a wide.	Short term—Effects last less than 3 years. Long term—Effects last more than 3 years.
Vegetation	Vegetation would not be affected or individual plants could be slightly affected; effects and limited to small area.	Changes would be localized, and affect one or more species pop-ulations.	A large segment of one or more species populations would be affected over relatively large area.	Considerable effects on plant populations over large areas.	Short term—Effects last less than 3 years. Long term—Effects last more than 3 years.
Water and Aquatic Resources	Impacts barely per-ceptible or below detection levels.	Changes to water quality, hydrology, and aquatic organisms detectable but relatively small.	Changes to water quality, hydrology, and aquatic organisms readily apparentbut localized.	Impacts to water quality, hydrology, and aquatic organisms severe or of exceptional benefit and over a wide area.	Short term—Effects last less than 1 year. Long term—Effects last more than 1 year.
Wetlands	Impacts to wetlands below detection levels or barely perceptible.	Changes to wetlands detectable but very localized.	Changes to wetlands readily apparent but relatively localized.	Impacts to wetlands severe or of exceptional benefit over a wide area.	Short term—Effects last less than 1 year. Long term—Effects last more than 1 year.
Wilderness	A change in wilderness character could occur, but not measurable and barely perceptible.	A change in wilderness character detectable and possibly measurable, but highly localized.	Changes in wilderness character would be measurable but local-ized.	Changes in wilderness character and associated values highly noticeable, severe or of exceptional benefit.	Short term—Effects extend only through the period of the project. Long term—Effects extend beyond the project period.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Wildlife	Impacts barely detectable or individuals could be affected but not populations. Effects limited to small area, and not measurable.	Changes localized, and measurable to one or more species, but would be of little consequence to the population.	A large segment of one or more wildlife populations affected over a relatively large area.	Impact is severe or of exceptional benefit to wildlife populations.	Short-term - Recovers in less than 1 year Long-term - Takes more than 1 year to recover
Aesthetics/ Recreational Values	An action that could cause a change to a recreational value or a natural physical resource, but the change would be so small that it would not be of any measurable or perceptible effect.	An action that could cause a change to a recreational value or a natural physical resource, but the change would be small, and, if measurable, it would be a small and localized effect.	An action that would cause measurable change to a recreational value or a natural physical resource.	An action that would cause a severe change or exceptional benefit to values. The change would have a substantial and possible permanent effect.	Short term—Effects extend only through the period of the project. Long term—Effects extend beyond the project period.
Cultural Resources	Impacts at lowest levels of detection – barely perceptible and not measurable.	The impact affects an archaeological or historic site with little data potential. The impact would not affect the character-defining features of a listed structure or building eligible for the National Register of Historic Places.	The impact affects an archaeological or historic site with modest data potential. For a National Register-eligible structure or building, the adverse impact would change the character-defining feature(s) of the structure or building but would not diminish the integrity of the resource and jeopardize its National Register eligibility.	The impact affects an archaeological or historic site with high data potential. For a National Register-eligible or listed structure or building, the impact would change the character defining feature(s) of the structure or building, diminishing the integrity to the extent that it is no longer eligible for listing on the National Register.	Short term—Effects extend only through the period of the project. Long term—Effects extend beyond the project period.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Ethnographic Resources	An action that could cause a change to a natural or physical ethnographic resource, but the change would be so small that it would not be of any measurable or perceptible effect.	An action that could cause a change to a natural or physical ethnographic resource, but the change would be small, and, if measurable, it would be a small	An action that would cause some change to a natural or physical ethnographic resource. The change would be measurable and would have a sufficient effect but be more localized.	An action that would cause a noticeable to severe change or exceptional benefit to a natural or physical ethnographic resource. The change is measurable and has a substantial and possible permanent effect.	Short term—Effects extend only through the period of the project. Long term—Effects extend beyond the project period.
Park Operations	An action that could cause a change in a park operation, but the change would be so small that it would not be of any measurable or perceptible effect.	An action that could cause a change in a park operation, but the change would be small, and, if measurable, it would be a localized effect.	An action that would cause some change in park operations. The change would be measurable and would have a sufficient impact on the operation in time or project funds lost.	An action that would cause a severe change or exceptional benefit to park operations. The change would be measurable in time or operational funds and would have substantial and possible permanent effect.	Short-term - Effects lasting for the duration of the treatment action Long-term - Effects lasting longer than the duration of the treatment action
Park Neighbors	An action that could cause a change in park neighbor(s) activities, but the change would be so small that it would not be of any measurable or perceptible effect.	An action that would cause a change in park neighbor(s) activities, but the change would be small, and, if measurable, it would be a localized effect.	An action that would cause some change in park neighbor(s) activities. The change would be measurable and would have a sufficient impact on the neighbor in time or funds lost.	An action that would cause a severe change or exceptional benefit to the activities of park neighbor(s). The change would be measurable in time or funds and would have substantial and possible permanent effect on neighbor relations.	Short term—Effects extend only through the period of the project. Long term—Effects extend beyond the project period.

Impairment

The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values. An impact to any park resource or value may constitute impairment, but an impact would be more likely to constitute impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is

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

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the park. A determination on impairment is made in the *Environmental Consequences* section for all impact topics.

Cumulative Impact

From Council on Environmental Quality (CEQ) regulations (1508.7), a "cumulative impact" is the effect on the environment that results from the incremental impact of the action(s) when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal, non-federal, or international) or person undertakes such action. Cumulative impacts are considered for both the no-action and preferred alternatives.

Cumulative effects of each alternative, when added to effects of the following past, present, and reasonably forseeable future actions, are analyzed in this EA. The following is a list of known activities in and around the project area:

- Going-to-the-Sun Road rehabilitation project, beginning 2004.
- Highway 89 construction work.
- Low level helicopter and fixed-wing administrative flights over the park.
- Commercial flights over the park.
- Lake McDonald/Headquarters wastewater system rehabilitation. Scheduled for 2003.
- Apgar water line replacement. Scheduled for 2003.
- Moose Fire salvage logging on Forest Service lands, 2003.
- Other prescribed and unplanned burns on neighboring lands.

Trans-Boundary Impacts[3]

NEPA guidance pertaining to proposed federal actions that may have trans-boundary effects extending across the border (i.e., Canada) and affecting that country's environment would be applied to applicable impact categories analyzed for each alternative. Scoping with Parks Canada and the British Columbia Forest Service identified potential effects resulting from implementing the preferred alternative, which would be analyzed where appropriate below.

Environmental Consequences—Alternative A (No Action)

Air Quality

Poor smoke dispersal periods would lead to periods of moderately adverse, short-term, direct impacts to park visitors and scenic vistas. Moderate adverse effects from suspended particulates during large wildland fires can occur long-term (up to approximately 30 days), resulting in possible violations of state standards for both particulate matter (PM-10) and visibility for short periods because of unanticipated changes in weather patterns. The limited-sized prescribed fires used to accomplish fuels reduction objectives would have direct short-term moderate adverse impacts and indirect negligible to minor beneficial effects in terms of reduced wildland fire emissions over the long-term.

Cumulative Effects. According to data from the IMPROVE Network (CSU 1993), organic carbon (i.e., fossil fuel combustion, etc.) contributed 57% of fine particulates and 44% of total aerosol light extinction in Glacier National Park. There were no strong seasonal variations except for nitrate peaking in winter. Smoke resulting from wildland and prescribed fires in and around the park would affect these concentrations cumulatively with potential moderate adverse impacts. There are no other anticipated or planned in-park projects that would add cumulatively to smoke conditions created under alternative A.

Trans-Boundary Impacts**.** Canada is susceptible to minor, short-term adverse smoke effects from park wildland fires managed under the 1991 plan. Long-term adverse effects would likely increase in intensity to moderate as fuels continue to be managed on a small scale with prescribed fire.

Conclusion. There would be adverse effects of moderate intensity, direct and short-term to air quality related values. Very long-term but negligible to minor indirect positive benefits are anticipated as fuels, and therefore smoke emissions from wildland fires are slowly reduced through limited prescribed fire treatments. Cumulatively, impacts to air quality in conjunction with impacts associated with reasonably foreseeable future actions have the potential to be adverse, and would be minor in intensity. Trans-boundary effects short-term to long-term would be adverse and range in intensity from minor to moderate.

[3]NEPA law directs federal agencies to analyze the effects of proposed actions to the extent they are reasonably foreseeable consequences of the Preferred action, regardless of where those impacts might occur [42 USC 4331 (b)(3)].

Because there would be no major, adverse impacts to air quality whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's air quality resources or values.

Natural Soundscapes

The effects of Alternative A, current levels of fire management, on natural soundscapes would be short-term, minor and localized adverse impacts due to noise from prescribed burning activities and mechanical fuel reduction.

Cumulative Effects. Alternative A, the no action alternative, would add to the effects of other helicopter flights over the park, but the adverse impacts would be short-term and minor.

Trans-Boundary Impacts. There would be no trans-boundary impacts with Alternative A.

Conclusion. Alternative A would produce minor site-specific short-term adverse impacts on natural soundscapes whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of natural soundscapes as a result of the implementation of Alternative A.

Threatened and Endangered Species and Species of Concern

Because wildland fires vary in intensity, the effects of Alternative A on listed species are difficult to predict. Prescribed fires, although small in scope, are more predictable and would likely result in limited positive effects on species and habitat over the long-term.

Gray wolves, being wide-ranging with their distribution tied primarily to prey species of deer, elk, and moose, need this prey-base year-round. They also need somewhat secluded denning and rendezvous sites, and sufficient space and minimal exposure to humans. Activities associated with firefighters working on line construction, burnout, patrol, mopup, and monitoring fire effects, hazard fuels removal with chainsaws that may include cutting, piling and burning, and prescribed fire operations including project preparation, line location, firing operations, holding, patrol and mopup, and fire effects monitoring may affect, but are not likely to adversely affect, the species in the short-term if mitigation measures are followed.

For grizzly bears, the focus of management activities on avoiding the potential for interaction with humans, together with limited long-term benefits such as increases in huckleberry produc

tion and wildlife prey habitat from small-scale prescribed fires and managed wildland fires, may affect but are not likely to adversely affect the grizzly bear or its habitat.

Under the current management plan, there is no expected effect on bald eagles. In rare instances, helicopter flights near water bodies where eagles may be located may affect, but are not likely to adversely affect the species.

There may be effects on lynx, as they would seek out areas of denser understory, but they may occasionally use small openings and increased visibility to prey on small mammals and other species.

Bull trout waters would rarely be affected by helicopter operations but are not likely to be adversely affected in the short or long-term.

Burned areas are known to attract some species following the initial flush of post-fire vegetation and may provide limited positive benefits to listed species in the short-term. However, with limited prescribed fires planned under the no-action alternative, a greater proportion of habitat would continue to lose diversity and vigor. This may affect, but is not likely to adversely affect, those listed species that use recent burn areas in the long-term.

Cumulative Effects. Cumulative effects from past, present, and potential future human presence from visitors, neighbors, staff, anticipated planned actions, and cooperators do produce incremental levels of disturbance to animals, depending on the season. However, these cumulative effects, combined with those actions listed above under the no-action alternative may affect, but are not likely to adversely affect, listed species or habitats.

Trans-Boundary Effects. Species that cross boundaries into Canada are generally subject to similar terrain and vegetative types as found in the U.S. Connectivity of habitat is key to ensuring that species remain productive and viable, and close cooperation in developing strategies for wildland fire is essential in mitigating any potential adverse effects. Under the no-action alternative, there may be an effect, but not likely an adverse effect, to listed species and habitats across boundaries.

Conclusion. It is determined that implementation of fire strategies under current management may affect, but would not be likely to adversely affect, listed species or habitats directly, indirectly, short or long term, cumulatively, or from trans-boundary effects.

Because there would be no major, adverse impacts to threatened or endangered species and species of concern whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's threatened or endangered species and species of concern.

Soils

Impacts of Alternative A on soils would be adverse, moderate in intensity, and short term from ground disturbance from some wildland fires and suppression operations on steep slopes. Scraping to mineral soil makes soils vulnerable to erosion events from periods of intense precipitation. Thunderstorms and heavy rainfall events may move soil on burned areas if they are not covered in rehabilitation operations on steep slopes. Some high-severity burn areas often do not receive adequate needle cast to help stabilize slopes, particularly where hydrophobic soils have caused temporary impermeability of water. Heavy accumulations of snow could occur where a large percentage of a watershed has burned, and with a warm, wet spring or extreme summer storms, the water could run off more quickly. Channeling and soil movement would be likely.

Longer term impacts on soils, particularly on burn areas from low-intensity prescribed fires, can receive some positive benefits of nitrogen mineralization and other chemical nutrients into the soils that often support vigorous new vegetative growth. Intensity of beneficial effect would be minor to moderate, localized, and long term.

Cumulative Effects. There are some past, present, and anticipated future cumulative effects on the soils resource resulting from the current fire management program at Glacier National Park. Soil movement from other causes is largely natural (i.e., from slides and precipitation events), and would result in minor adverse effects cumulatively over the long-term.

Conclusion. Effects to the soils resource would be adverse, short term, and moderate in intensity, with long-term minor to moderate beneficial effects and minor adverse cumulative effects long term.

Because there would be no major, adverse impacts to soils whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's soil resources.

Vegetation

The effects of Alternative A, current levels of management, on major vegetative types would be as follows.

Herbaceous Communities. The North Fork valley prairies (Big Prairie, Round Prairie, Sage Flats, and others) that evolved and were maintained by frequent, periodic low-intensity fire would slowly convert to conifer stands with native grasses and forbs slowly losing vigor with increased shading. Animals are often attracted to new growth, and with only limited-sized prescribed fire treatment areas under the present plan, minor to moderate adverse short-term impacts to native vegetation would likely result from highly concentrated use.

Shrubfields. Meadow areas listed above that are dry also include increasing densities of sagebrush that is also displacing species like willow and grasses. Adverse impacts to species diversity in these meadows would continue to increase to moderate levels over the long-term under current management. High elevation shrubfields, carrs and avalanche chutes are in low frequency fire regimes and would have negligible impact from this plan.

Deciduous Forest. The major concern here is aspen forest, occurring normally between mixed conifer and open prairie. Under current management, the likelihood of moderate adverse effects on aspen vigor and associated understory herbaceous decline without fire restoration would be increased over the long-term. Without periodic fire, aspen stands become old and decadent, and regeneration is limited.

Dry Coniferous Forest. Several areas within the park that contain pines, larch, and fir species along with lower elevation lodgepole pine communities would continue to see increases in fuels accumulations under current levels of fire treatments. Long-term, indirect moderate adverse effects on these dry coniferous forests would continue.

Moist Coniferous Forest. It is anticipated that these areas, by virtue of high soil moisture conditions and generally higher fuel moistures, would not be impacted under current management strategies.

Under continuing management, the direct effects of fire and non-fire treatments would not likely slow or reverse exotic species expansion in the long term; but the long-term indirect effects of present management are largely unknown. Under a program of limited, low-intensity prescribed fires, exotic species would likely spread or re-colonize burn areas in the short-term, producing minor adverse effects on native vegetation.

Exotic species would likely spread as a result of vegetation removal and manual/hand fuel reduction work in all areas of the park. This would result in a minor, long-term, indirect adverse effect on the vegetative community.

Cumulative Effects. Combined with past, current, and future fire and other resource management activities on adjoining ownerships and other past park management activities with actions under the 1991 Fire Management Plan, the cumulative adverse effects on park vegetative communities is expected to increase from minor to moderate in intensity.

Trans-Boundary Impacts. Under cooperating partnerships in wildland fire use with Parks Canada and the British Columbia Forest Service, diverse vegetative corridors for supporting native animal movement is expected to be a moderate benefit to management on both sides of the international boundary over the long-term.

Conclusion. Negligible to minor indirect short-term, and moderate long-term indirect adverse effects to vegetation would occur under alternative A. Cumulative adverse effects on park vegetation would range from minor to moderate in intensity, and trans-boundary long-term effects are anticipated to be beneficial to a moderate intensity.

Because there would be no major, adverse impacts to vegetation whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's vegetation resources.

Water and Aquatic Resources

Water flow and turbidity, temperature, and other attributes can be affected by high-severity fire. These effects in turn can impact fishes and the various aquatic organisms that support fisheries. For example, native trout prefer cold water.

Impacts of Alternative A to water and aquatic resources would be adverse, short term, and locally minor to moderate in intensity. Effects would be temporary and localized sedimentation and ashflow events following heavy rains over higher severity burn areas before colonizing plants can re-establish to stabilize soils. Soils that are severely burned do not allow water to infiltrate into the soil, which in turn increases run-off. Another potential impact would be the removal of riparian vegetation in some places. This would remove a sediment buffer from the edge of the water, increasing the chance for water quality degradation. Removal of vegetation near a stream would cause an increase in temperatures as the watercourse loses the shading protection of the plant canopy, in turn adversely affecting aquatic organisms.

If fuel load situations were not improved by the increased use of prescribed fire in watersheds, adverse effects to waters and aquatic organisms of moderate intensity in drainages with heavy fuel loads would increase in the long-term. It would also take longer for severely burned soil and vegetation to recover and subsequently reduce sediment run-off and sedimentation of waters.

Cumulative Effects. Cumulative effects resulting from past, present, and expected future actions on aquatic resources are not expected to exceed the resources' capacity to remain intact, with minor adverse cumulative effects anticipated long term.

Conclusion. Impacts to water and aquatic resources would be adverse and minor to moderate in intensity short term, with locally moderate adverse long-term effects expected and minor adverse cumulative effects.

Because there would be no major, adverse impacts to water and aquatic resources whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's water and aquatic resources.

Wetlands

Low- to moderate-severity burns where vegetative cover is partially reduced can increase water availability to streams and wetlands. For high-severity burns, rapid runoff with little surface cover can carry sediments into aquatic systems until soils begin to stabilize during the first year post-burn.
Impacts to wetlands in the short-term would be negligible under continued fire management strategies in the 1991 plan because there are no planned projects in or near these areas.

The long-term potential for adverse effects on marshes, bogs, fens, and ponds resulting from moderate and most high-severity wildland fires would remain negligible and would be beneficial to a minor intensity from low-severity fires unless those areas with steep and high-severity burns are subject to unusually high runoff events. In these rare events, adverse effects would increase to minor in intensity and short-term duration. These areas have more buffer capacity where bottomlands are normally wider, resulting in less impact.

Indirect adverse effects expected for permanent and intermittent lakes and riverine systems, particularly in steeper canyons and valleys, would likely be increased to moderate intensity over the long term as watersheds slowly recover from high severity fires.

Cumulative Effects. Cumulative effects to wetlands as a result of prescribed fire treatments and management of wildland fires for resource benefit, when combined with other planned activities, would be beneficial to a negligible or minor intensity as fuels are managed.

Conclusion. Short-term duration impacts would be negligible in intensity, whereas long-term effects would range from negligible adverse to beneficial with minor intensity and moderate adverse effects on all wetland systems following higher severity fires. Cumulative effects would be generally beneficial to a negligible or minor intensity.

Because there would be no major, adverse impacts to wetland resources whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's wetland resources or values.

Wilderness

Impacts on park wilderness values would generally be beneficial, of moderate intensity, indirect, and long-term as wildland fire is restored as a natural disturbance. Short-term direct impacts on wilderness character relating to wildland fire operations, including line construction, use of aircraft, and human presence would be minor as guidelines established in implementation plans are followed.

Currently, a hazard reduction management plan is in place to provide for protection of back-country administrative facilities in the park. Impacts associated with these activities include

noise from mechanical fuel reduction and clearing around structures and alteration of visual scene. However, there would be minor short term but negligible long-term indirect adverse effects from these activities on wilderness character.

Cumulative Effects. There would be potential for minor to moderate long-term adverse cumulative impacts to wilderness values in the park from unwanted wildland fires crossing the boundary from adjacent lands.

Conclusion. The no-action alternative relies on the current Fire Management Plan, and the impacts from which would be moderately beneficial, indirect, and long term to wilderness values. There would be negligible to minor short-term direct adverse effects to wilderness values and character, and potential for minor to moderate adverse long-term cumulative effects.

Because there would be no major, adverse impacts to proposed wilderness, whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's proposed wilderness resources or values.

Wildlife

Direct and indirect, short-term adverse effects of unwanted or prescribed wildland fire under Alternative A, in the form of death or injury, would likely be minor for small animals and negligible for larger animals. Although any species of animal may be directly injured or killed by wildfire, there is consensus that, at the population level, this is an insignificant source of mortality (Wright and Bailey 1982). Many ground dwelling species of small mammals may escape fire by going underground while larger species are usually capable of moving away. Even when small mammals are killed, the burned areas may be recolonized quickly (McMahon and deCalesta 1990). There is little documented evidence of direct avian mortality due to fire, however, wildland fires occurring during nesting season may temporarily disrupt nesting activities and limit access to prey, resulting in minor, direct adverse effects over the short-term.

Under Alternative A, current management, managed naturally occurring wildland fires in the park would have effects similar to those of the preferred alternative in that over the long term, those burned areas where resource objectives (such as creation of edge and openings) were met could result in moderate benefits to some species of wildlife. Prey species, including ungulates, may experience adverse impacts as habitat is altered, making them more vulnerable to predators, while predators may experience beneficial effects of fire due to increased prey availability. Some burns improve forage quality for herbivores, but responses of vegetation and wildlife are highly variable, and depend upon the season, size, uniformity, severity and intensity of the burn among other factors (Whelan 1995, Smith 2000).

Direct, short-term adverse effects of minor intensity to wildlife and habitat would be expected from Alternative A, including effects of suppression actions (i.e., line construction and holding, retardant use, camps, human presence, etc.) and hazard reduction operations that reduce cover

and other habitat components for wildlife species. Long-term negative results from continued fire suppression activities include continued loss of whitebark pine stands (thus affecting those species using pine nuts), such as grizzly bear and Clark's nutcracker (Morgan et al. 1994).

Cumulative Effects. Past, present, and reasonably foreseeable planned activities in the park combined with projects of neighboring management agencies would likely contribute to negligible cumulative adverse effects on wildlife; but the adverse effect would increase to minor intensity long term as fire suppression activities gradually increase fuel accumulations and raising risk of unwanted wildland fires resulting from growing human presence in and around park lands.

Trans-Boundary Impacts. There would be no trans-boundary impacts to wildlife under Alternative A.

Conclusion. Alternative A would produce direct and indirect adverse effects to wildlife from human presence, fire effects, and limited prescribed fire treatments; effects would be short term and minor to moderate. Long-term moderate benefits could be expected as habitat improves from wildland fires used for resource benefit. Cumulatively, negligible to minor adverse effects are expected into the future. Trans-boundary effects on wildlife are expected to be beneficial to a minor to moderate level.

Because there would be no major, adverse impacts to wildlife whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of wildlife resources.

Aesthetics/Recreational Values

Impacts to aesthetic values in the short term would be adverse and minor in intensity. Aesthetic values could be affected by recent wildland fires, limited prescribed fires, and/or manual fuel reduction operations near any recreational site or developed area. However, any adverse effects would diminish over time if pleasant visual transitions are created between developed areas and wildlands and as understory vegetation recovers naturally.

Impacts to recreational use short term would be adverse and minor to moderate in intensity where closures or restrictions on entry apply. Fire activity may result in temporary closure of roads, trails and campgrounds. Smoke also may temporarily adversely affect the recreational experience, but these effects would be mitigated in part from an effective public information and interpretation program.

Long-term effects from current management on aesthetic values would range from negligible adverse to beneficial and of minor to moderate intensity where areas have been treated. However, as treated areas are limited in size under the current schedule, there remains the

potential for continued adverse short-term effects on appearance from high-severity fires where fuels have not been treated.

In those over-story types such as ponderosa pine, the "natural" appearance is not a dense shrub/conifer understory; rather, with periodic fire, the typical scene should be an open, park-like appearance with a grassy understory in uneven-aged pine stands.

With limited application of prescribed fire, vast areas of dense, overgrown conifers would continue to occupy the typical scenery, broken occasionally by old burns or insect infestations. This represents a minor adverse long-term effect on recreationist attitudes on what should be a system shaped by periodic, low-intensity fire, mitigated in part through a timely information and education program.

Cumulative Effects**.** The cumulative effect of past, present, and potential future park actions, including fire management, may combine with increased visitation, and the effects are anticipated to be adverse and of negligible to minor intensity.

Conclusion. Impacts to aesthetics short-term would be adverse and minor in intensity, and long-term effects would range from negligible adverse to minor to moderate beneficial effects. Impacts to recreational values short term would be adverse with minor to moderate intensity, and long-term adverse effect of minor intensity. Cumulative effects on aesthetics and recreational values are expected to be adverse and of negligible to minor intensity.

Because there would be no major, adverse impacts to aesthetics or recreational values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's aesthetic or recreational resources or values.

Cultural Resources

Impacts to archaeological sites may be affected by fire, ground disturbance, collection, or vandalism from fire management activities. The effects of high-severity fire have been shown to be damaging primarily pictographs and surface burnable materials such as wood.

Suppression. Effects from suppression activities are potentially more intense because of the emergency nature of the actions taken, including ground disturbance from tool use and general human presence. Heating also has an effect on cultural resources. However, short-term, direct and indirect adverse impacts would be negligible, except in emergency situations where adverse impacts would likely increase to minor in intensity with appropriate mitigation measures followed.

Fire Use and Manual Methods. Under the no-action alternative, limited applications of prescribed fire and manual reduction of fuels around park properties, many of which are historic,

would continue. Mitigation protocols are in place that provide for protection of historic sites and features in the park. If adverse effects are identified, the park would consult with the Montana State Historic Preservation Officer and other consulting parties to develop and evaluate alternatives that could avoid, minimize, or mitigate the adverse effect. Thus, long-term direct and indirect adverse effects would be beneficial and negligible to minor in intensity.

Without an expanded program of fuels management, the increasing long-term potential for high-severity fire damage and/or threats to backcountry historic structures and cultural landscapes remains.

Cumulative Effects. There are no anticipated threats posed to park cultural resources from outside the boundaries, with the remote exception of untreated areas of heavy fuels accumulations that may add cumulatively with natural processes or other human presence acting on cultural sites and materials in the park, but adverse effects would be negligible.

Conclusion. Short-term, direct and indirect, adverse impacts would be negligible, and long-term adverse effects would be beneficial and negligible to minor in intensity. Cumulative adverse effects would be negligible.

Because there would be no major, adverse impacts to cultural resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's cultural resources or values.

Ethnographic Resources

Impacts to ethnographic resources are possible with human presence; however, before all planned management actions and during wildland fire emergencies, consultation with affected tribes with appropriate measures to avoid ethnographic features would result in no adverse effect short or long term. Effects may include inadvertent human presence in or around ceremonial sites, travel routes, or scenes from wildland fire operations. Any sites where plant materials are gathered could be adversely affected if fire personnel are unaware of these areas and their significance. If consultation and protection measures were taken before and during fuels management and wildland fire use activities in all FMUs, no adverse effects would be expected.

Cumulative Effects. The affected area(s) are limited to those identified by tribes and that support vegetation capable of burning. Potential adverse cumulative effects could result if appropriate mitigating measures are not taken in conjunction with other intrusive activities (recreational users, local public, etc.). Otherwise, no effects are anticipated to contribute to the cumulative impacts of other past and reasonably foreseeable future actions on ethnographic resources.

Conclusion. There would be no adverse effects short or long-term to ethnographic resources with appropriate avoidance measures taken. No cumulative effects are anticipated from the no-action alternative.

Because there would be no major, adverse impacts to ethnographic resources or values whose conservation are (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's resources or values.

Park Operations

Impacts on park operations would be adverse and minor to moderate in intensity over the short term. The variation would likely be in the area of staff demand resulting from large wildland fire incidents. Park operations in other divisions would likely be disrupted by demands relating to traffic control and law enforcement, possible emergency medical services, fire information services, transporting supplies and personnel, and follow-up maintenance work.

Overall park operations also would be adversely affected to a minor to moderate intensity level over the long-term because of more frequent wildland fires in and around park facilities. Damage from high-severity wildfires in or near developed areas may require the following repairs: landscaping work, repair of smoke damage to buildings, roads and trails repair, and sign replacement.

Cumulative Effects. Cumulative effects on park operations are potentially adverse and of minor intensity because of increased risk from increased visitation combined with accumulations of untreated fuels.

Conclusion. Short-term adverse effects and long-term adverse effects would range from minor to moderate under the no-action alternative. Cumulative effects would be potentially adverse and of minor intensity.

Because there would be no major, adverse impacts to park operations whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's operations.

Park Neighbors

Impacts to park neighbors from wildland fires or prescribed fires would be adverse, short-term, and range from negligible to moderate in intensity. In extreme cases, effects would be major from emergency wildland fire incidents that are out of control. For neighbors that border the park on the west side of the Continental Divide, fire management activities would have potential to threaten private holdings in the area of Polebridge and north. For parklands bordering the Flathead National Forest, existing agreements would provide for ease of management transition as fires cross the mutual boundary.

For the Blackfeet Reservation to the east, Glacier National Park is cooperating with the Bureau of Indian Affairs on Wildfire Hazard Assessment and Mitigation Plans. Blackfeet Nation communities under evaluation are East Glacier, Little Badger, Babb, St. Mary, Heart Butte, Kiowa and Two Medicine. Glacier's developed areas slated for assessment include St. Mary, Many Glacier, Two Medicine and Cut Bank. Joint Urban Interface Fuel Reduction projects (prescribed fire and/or thinning work) are a probable result of the analysis. Though landscape scale fuel reduction has been suggested (such as a boundary swath), this would be largely ineffective on fire behavior and a major impact on natural resources. For this reason fuel reduction planning will focus on an area immediately adjacent to structures of concern to provide defensible space.

Long-term effects would likely be beneficial but of negligible to minor intensity as fuels are gradually managed under the current treatment schedule. Neighbors on the eastern park boundary may be adversely affected to a moderate degree over the long term because untreated fuels would promote the potential for high-intensity wildland fires with high southwesterly or westerly winds.

The southern boundary of the park, from the Apgar area southwesterly, is occupied primarily by private landowners, and long-term adverse effects would remain relatively minor except for extreme burning conditions compounded by atypical wind events. Generally, fires would spread in similar patterns to the 2001 Moose Fire (i.e., east-northeasterly toward the Divide), and flanks generally can be managed more effectively.

Cumulative Effects. The potential for incremental minor to moderate adverse effects of human-caused wildland fires from more visitors over the long term combined with accumulating fuels that may be backlogged as a result of a limited treatment schedule.

Trans-Boundary Impacts. In analyzing other potential effects to resources protected by the Canadian government, there are negligible anticipated adverse trans-boundary impacts if the park continues to coordinate with the resource agencies in Canada responsible for wildland fire management. Along the Canadian border, the priority risk area is the common boundary with British Columbia and timber values protected by the British Columbia Forest Service.

Conclusion. Adverse impacts anticipated short term would be negligible to moderate in intensity, whereas long-term effects would range widely from beneficial/negligible to minor in intensity and adverse with a minor to moderate intensity depending on the specific area where park neighbors are affected. Cumulatively, there is potential for minor to moderate adverse effects on neighbors when combined with increasing human presence, and negligible trans-boundary adverse impacts.

Because there would be no major, adverse impacts to park neighbors whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park neighbor resources or values.

Environmental Consequences – Alternative B (Preferred)

Air Quality

Direct impacts of Alternative B to air quality in the short term would be adverse but minor to moderate with best available control technology applied to minimize emissions and would depend on fuel loading and burn intensity and duration.

Air-quality in and around the park would have long-term, indirect, moderate beneficial impacts as the number of acres treated is increased with Alternative B. However, during treatments with prescribed fire and wildland fire use incidents, if NAAQS cannot be met or if significant visibility impairment occurs, ignition would be halted and the burn would be suppressed or allowed to burn out.

Prescribed fires ignited to meet resource and protection objectives (i.e., hazard reduction, etc.) and naturally ignited wildland fires managed for resource benefits can collectively reduce years of fuel accumulation, resulting in long-term benefits to regional and local air quality through reduced emissions.

Cumulative Effects. When combined with burns from adjacent agencies and regional haze, there is potential for minor to moderate short-term adverse cumulative effects on air-quality-related values. However, protocols are in place to coordinate smoke emissions from all sources within the state. Long-term cumulative effects are expected to improve to moderately beneficial as fuels are managed to lower levels.

Trans-Boundary Effects. Burning conducted in Canada would generally not combine with smoke originating in the park, as prevailing winds would carry smoke away from Glacier National Park. However, smoke would have high potential to travel north and eastward and thus cross the international boundary. Emissions amount and direction can be generally regulated during prescribed burning or burning can be suspended with unfavorable transport winds, resulting in negligible to minor adverse short-term direct effects to receptors across the boundary. Again, indirect long-term effects would be beneficial and of moderate intensity to air-quality-related values.

Conclusion. Short-term direct effects to air quality would be adverse and minor to moderate in intensity, whereas minor long-term benefits of moderate intensity are anticipated as fuels treatments are accomplished and fire is restored as a natural disturbance. Cumulative adverse and short-term effects are anticipated to range from minor to moderate, whereas long-term effects are beneficial and moderate in intensity. Trans-boundary effects would range from negligible to minor in the short term but moderately beneficial over the long term.

Because there would be no major, adverse impacts to air quality whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National

Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's air quality resources or values.

Natural Soundscapes

Noise from natural fire is considered a natural sound. Activities associated with prescribed burning and mechanically reducing fuel loads around developed areas do not normally fall into wilderness and backcountry areas. All prescribed fires have the potential to run into wilderness and backcountry areas and create further impacts. The activities associated with prescribed burning and mechanical fuel reduction involve the use of chain saws for several days or weeks in specific locations. These activities, if located in or near wilderness or backcountry areas, would cause some wildlife species to be displaced from the area. Many of the mechanical fuel reduction operations are slated for the developed areas, but on occasion, work would run up to the wilderness boundary. Noise from prescribed burning, including preparation, would have minor, short-term, site-specific adverse impacts to natural soundscapes. Mechanical fuel reduction would have minor to moderate, short-term site-specific negative impacts.

Cumulative Effects. The noise created by preparations for prescribed burns and mechanical fuel reduction could add to the noise generated by helicopter and fixed-wing administrative and commercial flights over the park, and by construction activities. However, the cumulative effect would be minor, short term, localized adverse.

Trans-Boundary Impacts. There would be no trans-boundary impacts with Alternative B.

Conclusion. Alternative B would not produce major adverse impacts on natural soundscapes whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment to natural soundscapes as a result of the implementation of any of the alternatives.

Threatened and Endangered Species and Species of Concern

As discussed earlier, fire is an important process in the maintenance of suitable habitat for many wildlife species. Some species of wildlife are habitat generalists and can adapt to a wide variety of habitat conditions, while others have very narrow and specific habitat requirements. Therefore, fire can be beneficial or detrimental to habitat, depending on the circumstances in which it is present and species it affects. Strategies under the preferred alternative are similar to the no action alternative, with the exception that prescribed fire and manual fuels management would increase in scope and extent under a revised multi-year treatment schedule.

Gray wolves would likely benefit by increased improvement of winter and spring range for ungulates from increased fire use under the preferred alternative in habitat that wolves frequent.

There may be an effect from actions under the preferred alternative, but it would not likely adversely affect wolves or habitat from the immediate post-fire effects.

In the short-term, there may be an effect resulting from actions under the preferred alternative, but not likely an adverse affect on grizzly bears or habitat from immediate post-fire effects. Fire use and prescribed fire plans would include constraints for fires that may damage favorite grizzly foraging areas during the growing season. In the long-term, fire can have a stimulating effect on whitebark pine reproduction, potentially benefiting grizzly habitat. Managed fire also would create openings in the forest and invigorate huckleberry production and would indirectly benefit the species positively through habitat improvement in the long term.

Eagle habitat benefits by the presence of perching sites that are created from burned snags. Habitat for prey species can be improved with herbaceous and shrub cover stimulated and maintained by periodic fire. There may be an effect, but there would not likely be an adverse effect on bald eagles or habitat short term or long term.

The bull trout and its habitat may be temporarily affected by sediment and debris during and after prescribed and wildland fires. Impacts would be negligible with mitigation measures in place. Therefore bull trout may be affected, but would not likely be adversely affected.

There may be effects on Canada lynx, as they would seek out areas of denser understory, but may occasionally use small openings and increased visibility to prey on small mammals and other species. Effects are not anticipated to be adverse. There would be long term beneficial effects to Canada lynx as snowshoe hares recolonize burned areas, and burns would provide the forest mosaic required by lynx.

Activities associated with firefighters working on line construction, burnout, patrol, mopup, and monitoring fire effects, hazard fuels removal with chainsaws that may include cutting, piling and burning, and prescribed fire operations including project preparation, line location, firing operations, holding, patrol and mopup, and fire effects monitoring may affect, but not likely adversely affect, listed species in the short term if mitigation measures in place are followed.

Species of concern would be affected by actions under the preferred alternative. The golden eagle migration route follows mountain ranges and ridges in the park and is a significant event. A significant risk to these raptors is helicopter operations associated with fire management activities. However, during migration, helicopter routes are carefully planned to avoid eagles. Thus, short-term adverse effects would be negligible and long-term effects from the opening and maintenance of herbaceous meadows by fire that in turn attract small mammals would be moderately beneficial to eagles and other raptor species of concern

It is expected that under the preferred alternative, potential short-term effects of the increased prescribed fire program may affect, but would not likely adversely affect, listed species and species of concern.

Cumulative Effects. The presence of personnel and noise in the project areas would add to the effect of disturbance created by construction activities in and around the park, and administrative

flights over the park. Cumulative effects would be minor to moderate localized short-term adverse, and minor to moderate long-term beneficial.

Trans-Boundary Impacts. Connectivity of habitat is key to ensuring that species remain productive and viable, and close cooperation in developing strategies for wildland fire is essential in mitigating any potential adverse effects. With this management approach as a priority, there may be an effect, but not likely an adverse effect, to listed species, species of concern and their habitats.

Conclusion. Implementation of fire management strategies under Alternative B may affect, but would not likely adversely affect, listed species or habitats directly, indirectly, short or long term, cumulatively, or from trans-boundary activities.

Because there would be no major, adverse impacts to threatened and endangered species or species of concern whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's threatened and endangered species or species of concern.

Soils

Wildland fires of low to moderate severity generally have natural restorative processes that can protect soils. Needle drop from scorch and heat, falling trees that trap downhill soil movement, and increased sunlight that produces rapid re-sprouting are some protective mechanisms. However, high-severity (stand replacement) burn areas, particularly on steeper slopes, can cause abnormal water runoff and soil movement during or following heavy precipitation events. Sedimentation of stream channels and road surfaces can often result. When soil organic material burns with high intensity, hydrocarbons can infiltrate the soil and solidify, cementing soil particles together. The result can be hard, water-repellent soil that sheds water on slopes. Moderate- and low-intensity fires of any origin promote the release of nutrients contained in vegetation. These nutrients would enter the soil and contribute to new growth at varying rates of recovery.

Impacts to soils over the short duration would be adverse and negligible to moderate in intensity, particularly in localized areas where fires of mixed severity occur or where some ground disturbance associated with managing fires occurs. However, long-term (within one growing season) impacts to soils resource as vegetation recovers would be beneficial at a minor to moderate level where nutrients have been made available and soil microbes have not been disturbed. Prescribed fires of low intensity managed under a multi-year schedule would leave the organic layers generally intact.

Cumulative Effects. Any soil loss associated with management actions would be lessened by requirements to provide (or leave) ground cover and other erosion controls following fire. The

preferred alternative would add to the effects of erosion, compaction, and weathering to soils due to construction activities. Cumulative effects would be long-term, localized, minor and adverse.

Conclusion. Fire-management-related actions would have an adverse, short-term, negligible to moderate effect on the soils resource. Long-term beneficial effects of minor to moderate intensity can be expected. Cumulative effects would be long-term, minor and adverse.

Because there would be no major, adverse impacts to soils whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's soil resources.

Vegetation

Herbaceous Communities. The North Fork valley prairies (Big Prairie, Round Prairie, Sage Flats, and others) that evolved and were maintained by frequent, periodic low-intensity fire would slowly begin to recover as periodic fire treatments are applied on a larger scale under the Multi-year Schedule. Thus over the long-term, both vigor and species diversity would begin to respond positively, producing moderate beneficial effects.

Shrubfields. An associated benefit from treatment of prairie communities above is the re-invigoration of willow and grasses. Moderate long-term beneficial effects would be realized as these prairie communities respond to reduced shrub cover and increasing species diversity occurs.

Deciduous Forest. The likelihood of continued adverse effects on aspen vigor and associated understory would occur without large-scale fire restoration on the eastside. However, the potential for moderate beneficial effects to westside aspen and associated species over the long-term would increase as fire use strategies are applied under the preferred alternative.

Dry Coniferous Forest. Several areas within the park that contain pine, larch, and fir species along with lower elevation lodgepole pine communities would likely see moderate benefits over the long-term as fuels are reduced and openings are created from mixed-severity burns.

Moist Coniferous Forest. Over the short-term, negligible impacts would likely occur from strategies under the preferred alternative. However, some minor beneficial effects via reductions in fuels accumulations would likely be expected as wildland fires and mixed-severity burns reach into these moist areas to a limited degree.

For most communities, fuels over the long term would be reduced to more natural ranges of variability; water and carbon cycles would benefit from periodic applications of fire under controlled conditions.

For most proposed prescribed fire projects, the area (in acres) affected by manual preparation operations normally is estimated to be less than 1% of the total size of the project. This can vary depending on the availability of existing barriers.

Planned manual hazard fuel reduction treatments followed by low-intensity debris burning at times chosen by management would result in a gradual reduction in the potential for destructive interface fires. Priority area considerations for hazard fuels treatments are where slopes are greater than 30%, where strong winds regularly occur, and where very high or extreme fire danger and/or ignition sources exist. Examples of possible ignition sources include overhead electrical service, campfires, and people.

In this analysis, the reduction in exotic species invasion and population expansion and encouragement of native vegetation is an objective of fire management. Thus, the preferred alternative analyzed is viewed in the context of prevention of further establishment and spread of exotic species. There is always a risk of invasion of undesirable species following fire, regardless of type or intensity, over the long-term. This can result from not only the intensity of fire but ground disturbing activities such as fireline construction, rehabilitation activities including constructing waterbars to prevent runoff and re-covering fireline. Also, equipment tires and cleaning of various tools and equipment may help spread unwanted seed.

Direct, short-term impacts to existing populations of exotic species in the park would range from beneficial to adverse and of minor to moderate intensity, depending on factors such as fire intensity and degree of ground disturbance following fire. The affect from expanding fire use in the park would result in the more aggressive species occupying niches of higher intensity burned areas. Post-burn effects from low-intensity fire that primarily consumes surface fine fuels (i.e., needle litter, dead herbaceous materials, etc.) with minimal mineral soil exposure would tend to favor colonization or cover increase by native perennial species.

The long-term direct and indirect effects of managed fire on exotic species are largely unknown. In most cases, total eradication or effectively limiting numbers of exotics is nearly impossible. Only through management programs that encourage native biota over the very long term can detectable positive benefits begin to be realized. The net result expected from fire restoration is more the effect of native plant communities having the potential to compete with and displace exotic plants.

Cumulative Effects. The preferred alternative would add to the minor short-term adverse effects of construction activities on vegetation. Moderate beneficial cumulative impacts would result from incremental protection of plant biota from severe wildfires while species diversity across the landscape is encouraged. Under this combined ecosystem approach to fire restoration on a larger scale, a gradual reversal of the cumulative effects of past actions such as fire suppression and the limited reintroduction of fire as a natural disturbance factor in a variety of habitats would occur. Human presence (including fire management activities) has and would continue to pose a level of risk of exotic introductions into the park. However, as native vegetation increases in diversity and vigor, adverse cumulative effects are expected to be offset. Cumulative effects would be minor short-term adverse, and moderate long-term beneficial.

Trans-Boundary Impacts. Under cooperating partnerships in wildland fire use with Parks Canada and the British Columbia Forest Service, healthy and diverse vegetative corridors for supporting native animal movement is expected to result in a moderate beneficial effect on both sides of the international boundary. Risk of exotic species spread or introduction across the international boundary is anticipated to be negligible, but long-term moderately beneficial effects would occur as native plant diversity is favored by fire restoration.

Conclusion. Impacts to vegetation in the short term would be adverse and negligible to minor in intensity, whereas positive long-term benefits of moderate intensity would result from fire restoration to fire-dependent communities. Cumulatively, moderate beneficial effects are anticipated, and moderate beneficial effects are expected from managing vegetation with long-term fire across the international boundary. Short-term direct effects would range from beneficial to adverse, with intensities minor to moderate. Long-term effects are little understood, but as fire restoration favors native plant associations, beneficial effects of unknown intensity would likely result. Cumulative adverse effects from increased risk of introductions from growing visitor numbers to the park are expected to be offset to a minor degree over the long-term. Trans-boundary effects are anticipated to be negligible.

Because there would be no major, adverse impacts to vegetation whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's vegetation resources or values.

Water and Aquatic Resources

Water flow and turbidity, temperature, and other attributes can be affected by high-severity fire. These effects in turn can impact fishes and the various aquatic organisms that support fisheries. For example, native trout prefer cold water.

The assumption is made that effects to soils and water from erosion following a high-severity wildfire event and, in some cases, a mixed-severity prescribed fire or fire use action, are possible. However, in these cases, preventing adverse effects is difficult, and rehabilitation is often required.

This analysis also overlaps the wetlands analysis discussed below but is wider in scope as fisheries (except for bull trout, which was discussed under T&E species above), aquatic invertebrates, water quality, and water quantity are all considered.

It is possible that with the proposed increased fire use of prescribed fire, impacts to water quality from soil erosion could increase. This short-term, direct minor adverse effect would be somewhat mitigated by the fact that the managed use of fire would do less damage to soil and plants, allowing quick recovery of the area and resultant reductions in water quality deterioration. If the landscape is not treated by prescribed fire, a slow increase in unwanted wildland fire risk would

lead to increased water quality concerns due to the more severe affects of high-severity wildland fire on soil and plants, which leads to erosion into the water resource.

Long-term effects to water and aquatic resources would range from unchanged to beneficial as the use of prescribed fire allows for the protection of riparian and shoreline plants which act as sediment traps. This barrier would help to protect the water resources from deterioration from increased sediment run-off after a fire. Planned prescribed fires that serve to gradually reduce fuels in altered watersheds would produce moderate beneficial effects to aquatic systems over the long term.

Manual fuels management projects should not adversely affect water or aquatic resources, as avoidance measures would be followed. Management of wildland fires for resource benefits would protect sensitive riparian areas in maximum manageable area (MMA, see Appendix A) designations and the park would practice "minimum impact management techniques," resulting indirectly in potential positive long-term effects on park aquatic systems as vegetative diversity and stability are restored.

Cumulative Effects. Under the preferred alternative in combination with past and present park management of aquatic resources, it is expected that minor to moderate long-term cumulative benefits would result for lakes, streams, and aquatic organisms and their habitat from the restoration of fire as a natural disturbance event and the gradual reduction in high-severity wildfire potential.

Conclusion. Without management intervention under the preferred alternative, aquatic systems can expect minor localized adverse effects short term. Moderate beneficial indirect effects long-term and moderate long-term beneficial cumulative effects are expected under the preferred alternative for all strategies and in all the revised Fire Management Units.

Because there would be no major, adverse impacts to water and aquatic resources whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's water and aquatic resources.

Wetlands

Low- to moderate-severity burns where vegetative cover is partially reduced can increase water availability to streams and wetlands. For high-severity burns, rapid runoff with little surface cover can carry sediments into aquatic systems until soils begin to stabilize during the first year post-burn.

Implementation of Alternative B, the new Fire Management Plan that includes actions under the multi-year treatment schedule, would begin to restore historical levels of forest structure and meadow diversity over time, with appropriate mitigation measures based on consultations with resource staff included in project plans in all Fire Management Units.

The short-term adverse effects on marshes, bogs, fens, and ponds resulting from moderate and most high-severity wildland fires would be negligible to moderate, and would be beneficial to a minor to moderate intensity from low-severity wildland and prescribed fires unless those areas with steep and high-severity burns are subject to unusually high runoff events. In these rare events, effects would be adverse, minor and short-term. These areas have more buffer capacity where wetlands are normally wider, resulting in potentially less impact.

Moderate beneficial effects on most wetlands systems, especially on the West Side, are expected over the long term. Possible re-watering of former springs and seeps in and around wetlands occurring as a result of reductions in unnaturally dense overstory that competes for ground and potential surface water may also be of benefit.

Cumulative Effects. Historically, there are no known past or present incremental, direct human adverse impacts to park wetlands. However, early fire exclusion policies created localized unnatural vegetation conditions in and around moist meadows and wetlands. The potential adverse effects of fire management activities would be offset by minor to moderate long-term cumulative benefits due to restoration of the natural fire cycle to riparian vegetation.

Conclusion. Under the preferred alternative, minor to moderate direct adverse, and minor to moderate beneficial effects on wetlands from variations in wildland fire severity are expected. Long-term, beneficial effects of moderate intensity are expected, with minor to moderate long-term cumulative benefits are anticipated under the preferred alternative.

Because there would be no major, adverse impacts to wetlands whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's wetland resources or values.

Wilderness

Impacts associated with the backcountry hazard reduction plan and wildland fire management activities are similar to the no action alternative, in that negligible to minor short-term adverse effects to wilderness values would occur. Activities such as line construction, use of aircraft, and firefighter presence would all be subject to constraints outlined in implementation plans.

Impacts to wilderness character and values over the long-term would be beneficial, and moderate in intensity as fire is restored to areas of the Glacier backcountry. Fires of mixed severity, particularly west of the Continental Divide, would be more typical of the historic fire regime and would add to the wilderness character as being shaped and maintained by natural disturbance events such as fire.

Cumulative Effects. Firefighter presence on wildland and prescribed fires in the backcountry would have a negligible to minor short-term adverse cumulative effect along with the presence of

backcountry users for periods of time ranging from a day to perhaps a month or more. Aircraft over flights associated with fire management activities and other administrative and commercial uses may temporarily detract from user experience. Reasonably foreseeable future actions would be anticipated to contribute minor to moderate cumulative effects on wilderness character long-term, as fire is restored as a natural disturbance event across the landscape and increasingly offsets effects associated with non-fire related activities. Cumulative effects would be negligible to minor short-term adverse, and minor to moderate long-term beneficial.

Conclusion. Short-term effects would be adverse, and negligible to minor in intensity. Effects to wilderness character long-term would be beneficial and moderate in intensity, whereas cumulative effects are anticipated to range from adverse with negligible to minor intensity, to beneficial long-term cumulative effects of minor to moderate intensity.

Because there would be no major, adverse impacts to wilderness whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's wilderness resources or values.

Wildlife

Effects of fire on wildlife can be summarized as the following (Agee 1993):

1) Fire may be deterimental or beneficial, and does not affect all species of wildlife equally.
2) Direct effects of fire include death due to suffocation, and primarily affects species with small home ranges. Larger animals can usually move out of the way.
3) Many species ignore fire, while others are attracted to it because of the availability of prey.
4) The major effect of fire is on animal habitat: food, cover, and water.
5) Often, short-term effects of fire are detrimental, while long-term effects are beneficial to wildlife habitat.

In general, most studies that have been conducted show that wildlife mortality in fires is surprisingly low. Although some rodents are undoubtedly killed in fires, studies show that rodent populations typically increase shortly after a fire. Since they have such a short reproductive cycle, their populations tend to be quite resilient (Whelan 1995).

One species group benefited by fire includes woodpeckers, particularly black-backed woodpeckers, which mainly forage in recently burned stands, because insect populations are abundant in snags left by fire. This also indicates that fire benefits some insect populations, which are necessary for assisting in the decomposition process. Other insect populations that live in the litter layer on the soil could be consumed in a fire. These populations can rebuild when a litter layer is reaccumulated. Flammulated owls require periodic underburns, so they can see through the undergrowth to forage. Fire provides openings in the forest where many forbs and grasses grow providing great habitat for elk and deer. Huckleberry production improves after a fire, benefiting the bears, among other wildlife (Agee 1993).

Species, such as great gray owls, that prefer to live in old-growth forests probably see the least direct benefits from fire. These species could show reductions in population immediately following a fire in a late seral stand. While naturally ignited wildland fires could occur in these mature forests during extrememly dry years, old-growth forests would not be targeted in our prescribed fire operations. Species dependednt on older stands benefit from managing for a mosaic of successional stages, which would retard the likelihood of large, stand-replacement fire carrying through uniform stands to mature forest stands. Allowing for the presence of a wide range of successional or seral stages on the landscape provides a wide variety of habitat niches for the greatest diversity of wildlife.

Effects of fire vary by individual species, but overall, fire is important for ensuring suitable habitat for most native wildlife by creating and maintaining vegetative diversity and vigor. Prescribed fires generally alter only a small portion of habitats for larger mammalian predators, so adverse effects to them are negligible. There may be minor to moderate short-term indirect beneficial effects of prescribed burning to predators as prey species become more vulnerable and available. Likewise, there would be minor short-term indirect negative effects to the prey species, as cover is lost over much of their relatively small home ranges (McMahon and deCalesta 1990).

Direct, short-term adverse effects of Alternative B to wildlife and habitat would be minor, from temporarily displacing animals resulting from human presence, including aircraft and vehicular traffic, and some destruction of forage in project areas listed under the revised multi-year Prescribed Fire Plan, and from fuel reduction. However, this is not expected to be a long-term adverse effect as human presence can be minimized through proper planning and coordination with park wildlife staff.

We anticipate moderately beneficial direct, long-term effects from Alternative B. Habitat conditions for many plants and wildlife species could be expected to gradually improve in and around treated areas. Mosaic burns ignited by management or fires managed for resource benefits can result in improved forage vigor by increasing the amount of ash and nutrients available, provided that the fire interval is long (Tiedemann et al.). When appropriate and not a safety concern, snags would be left for wildlife habitat (McMahon and deCalesta 1990). Most streams would be buffered from fire effects because of the relative abundance of soil moisture and high humidity.

Cumulative Effects. The effects of noise and disturbance from park personnel and aircraft during fire management activities would add to the effects of wildlife disturbance from construction activities and other flights. It is expected that as park visitation increases in the future, particularly during roosting/nesting season and when wildlife is the most active, combined with increased fire management activities both on and adjacent to the park, wildlife would be adversely affected to a minor intensity level. Cumulative effects would be minor to moderate, short-term adverse.

Trans-Boundary Effects. Wildlife corridor and associated habitats that cross the international boundary would benefit moderately from the restoration of fire over the long-term. Effects of fire

vary by individual species, but overall, fire is important for ensuring suitable habitat for most wildlife by creating and maintaining vegetative diversity and vigor.

Conclusion. With Alternative B, direct, short-term adverse effects to wildlife habitat and animals would be minor in intensity. However, moderate direct long-term beneficial effects are expected as fire is restored to park habitat through planned and unplanned ignitions under the preferred alternative, resulting in increased habitat diversity and plant vigor. Cumulative effects are anticipated to be adverse but minor, whereas trans-boundary effects would be moderately beneficial.

Because there would be no major, adverse impacts to wildlife whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's wildlife resources or values.

Aesthetics/Recreational Values

Impacts to recreational use short-term would be adverse and of minor to moderate intensity where closures or restrictions on entry apply. Fire activity may result in temporary closures of roads trails and campgrounds. Smoke may also temporarily adversely affect the recreational experience, but these affects can be mitigated in part from an effective public information and interpretation program.

Long-term effects on aesthetic values would be beneficial and of minor to moderate intensity where increased areas have been treated under the multi-year schedule. Mixed-severity and larger scale prescribed fire treatments combined with naturally ignited wildland fires managed for resource benefit strategies would bring moderately more desirable scenery in the long-term, including habitat diversity that would optimize wildlife viewing, provide enjoyment of healthy understory plant life, and present a visually desirable mosaic of age-classed overstory trees.

Cumulative Effects**.** The cumulative effect of past, present, and potential future park actions, including fire management, would be increased visitation and recreational use in Glacier National Park. The minor, beneficial cumulative impacts associated with implementation of the preferred alternative would minimally offset the overall adverse cumulative impacts of past actions because of the increased number of users to the park.

Conclusion. Minor to moderate adverse effects short-term on aesthetic and recreational values can be expected from wildland fires that prompt restrictions and closures, with minor to moderate desirable effects long term, and minor, beneficial cumulative effects that would minimally offset the adverse effects from past actions with increasing visitor and recreational use.

Cultural Resources

Suppression. Short-term, direct effects to those cultural resources and associated landscape features on NPS lands resulting from wildland fire suppression activities would not be measurably adverse if the mitigation measures described above are applied. Similarly, there would be negligible adverse long-term effects to cultural resources from suppression.

There remains the potential for measurable short-term direct and indirect adverse effects from unwanted wildland fires and/or suppression actions until such time as fuel loads around developments are mitigated to within a more natural range of variability. Methods of protection for backcountry structures, such as wrapping with fire-resistant materials, use of sprinklers, firefighter briefings, and construction of defensible space continue to increase protection of these resources. Complete fireproofing is not possible, but the probability of losing a structure to a wildland fire can be reduced substantially.

Wildland fire use, manual fuels reduction, and prescribed fire. Project planning for prescribed fires and manual fuel reduction in compliance with Section 106 procedures would identify the potential for adverse effects on cultural resources. Mitigation to avoid or lessen adverse effects would be implemented.

Minor to moderate long-term beneficial effects under the preferred alternative are expected from the increased treatments of wildland fuels to meet protection and resource objectives as mitigation measures are identified and implemented into project plans and activities. Benefits include a decreased potential for wildland fires effects resulting from higher intensities and longer duration of the combustion process in and around cultural sites.

Implementation of the new Fire Management Plan would result in benefits such as increased defensible boundaries, lower fire intensities, and lower heating residence times over the long-term.

Cumulative Effects. Visitor use, local residents, and the general public may add cumulatively to fire management activities, including firefighter presence around these values as prescribed fire operations increase. Long-term cumulative effects are anticipated to be moderately beneficial as plant communities are restored to more natural ranges of variability across the landscape.

Conclusion. Under the preferred alternative, no measurable short-term effects and minor to moderate long-term beneficial effects would occur to cultural resources as protection objectives are accomplished. Cumulative effects are expected to be beneficial long-term, to a moderate intensity as fuels and vegetative communities are restored to historical levels in those areas where fire is used as a resource management tool.

Because there would be no major, adverse impacts to cultural resources whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's cultural resources or values.

Section 106 Summary: After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Part 800.5, *Assessment of Adverse Effects*), the National Park Service concludes that implementation of the preferred alternative would have *no adverse effect* on cultural resources of Glacier National Park.

Ethnographic Resources

Before all planned management actions and during wildland fire emergencies, consultation with affected tribes with appropriate measures to avoid ethnographic features would result in no discernable adverse effects.

Long-term effects would be beneficial with minor to moderate intensity. These effects would result from the increased effort to restore fire to the park landscape and which may include enhanced vegetative diversity and vigor of those plants considered ethnologically important.

Cumulative Effects**.** The establishment of a more diverse ecosystem that encourages native plant growth rather than exotic species under the preferred alternative may enhance traditional plant-gathering activities. Also, no reasonably foreseeable future management actions are anticipated. Overall the long-term cumulative effect of the preferred alternative on ethnographic resources in the park would be beneficial and minor to moderate in intensity.

Conclusion. Overall long-term effects would be beneficial and range from minor to moderate, depending on the scope of fire applications to meet resource objectives, including enhancement of native vegetation. Cumulative effects are anticipated to be of minor to moderate benefit long term.

Because there would be no major, adverse impacts to ethnographic resources whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of the park's ethnographic resources or values.

Section 106 Summary: After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Part 800.5, *Assessment of Adverse Effects*), the National Park Service concludes that implementation of the preferred alternative would have *no adverse effect* on ethnographic resources at Glacier National Park.

Park Operations

Short-term impacts to overall park operations would be adverse, and of minor to moderate intensity. As with the no action alternative, park operations would likely be disrupted due to demands relating to traffic control and law enforcement, possible emergency medical services, fire information services, transporting supplies and personnel, and follow up maintenance work.

Long-term adverse effects on park operations would be negligible to minor in intensity, resulting from a proposed program where there are more frequent prescribed fires and manual fuels reduction work but less potential for destructive wildland fires in and around park facilities. Park area closures would diminish in number and length of time, benefiting businesses, visitors, residents and employees. Legitimacy would also build with cooperators, employees, concessions operators, and the public.

Cumulative Effects**.** The short-term, minor, adverse impacts of the preferred alternative, in conjunction with adverse impacts of other reasonably foreseeable future park activities, could result in minor adverse cumulative impacts to park operations; however, any adverse impacts of the preferred alternative would be a small component of any overall cumulative impact.

Conclusion. Minor to moderate adverse short-term effects on park operations are expected, with negligible to minor long-term adverse effects and minor adverse cumulative effects but under the preferred alternative only a small component.

Because there would be no major, adverse impacts to park operations whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Glacier National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning documents, there would be no impairment of park operations.

Park Neighbors

Short-term impacts of Alternative B would likely be adverse and minor in intensity. As with the no-action alternative, emergency wildland fire incidents that are out of control may present unusual risks for neighbors that border the park on the west side of the Continental Divide, and fire management activities would have potential to threaten private holdings in the area of Polebridge and north. For parkland bordering the Flathead National Forest, existing agreements would provide for ease of management transition as fires cross the mutual boundary.

Long-term effects would likely be beneficial but of minor to moderate intensity as fuels are managed more aggressively under the revised treatment schedule. The Blackfeet Indian Reservation along the eastern park boundary may experience direct and indirect, negligible to moderate, short-term and long-term adverse impacts where areas of untreated fuels would promote the potential for high-intensity wildland fires with high southwesterly or westerly winds.

Primarily private landowners occupy the southern boundary of the park, from the Apgar area southwesterly, and long-term adverse effects would be relatively negligible except for extreme burning conditions compounded by atypical wind events.

As fuels treatment and other management objectives are met in all FMUs, long-term (5 years and beyond) positive benefits are expected in favor of the park neighbors. A key-mitigating factor is

a program of ongoing close coordination and cooperation with all affected neighbors. An example of this close coordination would be the joint Fire Management Planning effort currently underway with the Flathead National Forest.

Cumulative Effects. Cumulative effects of incremental increases in visitation and other activities from neighbors, past into the future, are anticipated to be moderately beneficial in the long-term as resource and protection objectives are met through the expanded treatment program under the preferred alternative.

Trans-Boundary Impacts**.** Long-term beneficial effects are anticipated and range from negligible to moderate. As the park continues to improve coordination with the resource agencies in Canada responsible for wildland fire management, the priority risk areas would likely be treated long-term near or on the common boundary with British Columbia, and risk to timber values from fires threatening the boundary would diminish gradually.

Conclusion. Short-term direct effects to park neighbors would be adverse and minor in intensity except for the most extreme burning conditions; long-term negligible to moderately beneficial effects park-wide would be expected. Cumulative effects are expected to be beneficial and of moderate intensity for neighbors long-term, and trans-boundary effects beneficial with an intensity range of negligible to moderate as fuels are managed along the boundary over the long-term.

SCOPING, CONSULTATION AND COORDINATION

Scoping

A joint interdisciplinary team was formed that consisted of representatives of Glacier National Park, Flathead National Forest, and Wildland Fire Associates. The Glacier National Park portion of the team began scoping in November 2001. Public scoping meetings were held November 13 and 19, 2001 in Browning and West Glacier, Montana. The team also conducted scoping sessions at the Flathead Agency of the Bureau of Indian Affairs, Parks Canada and the British Columbia Forest Service, Glacier National Park, and the Flathead National Forest Supervisor's Office.

A Fire Management Plan and Environmental Assessment was released to the public for a 30 day comment period in October, 2002. Two public open houses were conducted after this release on December 18 and 19, 2002, at Browning and West Glacier, Montana. As a result of the comments received during the 30 day public comment period, a revised plan has been prepared and was released in March 2003 for another 30 day public review.

Consultation and Coordination
The park initiated informal consultation with the U.S. Fish and Wildlife Service per Section 7 of the Endangered Species Act. A letter of response received is included in Appendix G.

Consultation in accordance with Section 106 of the National Historic Preservation Act is ongoing with the Montana State Historic Preservation Officer.

Consultation with the Confederated Salish and Kootenai Tribes of the Flathead Reservation and a representative of the Blackfeet Nation was held in Browning, Montana on July 10, 2001. During the week of December 3rd, 2001, Glacier Fire and Cultural Resource staff participated in a Blackfeet Tribal Council Meeting during which the proposed alternatives were presented as described in the first EA on this project.

A press release has been released announcing the availability of this second EA to the general public, with copies sent directly to interested individuals, groups, and agencies. A 30-day comment period will be allowed for review and input. Public comments, written and verbal, would be collected and analyzed. A Notice of Intent to prepare an Environmental Impact Statement, or a Finding of No Significant Impact would be signed by the Superintendent, Glacier National Park, and the Regional Director, Intermountain Region, National Park Service.

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APPENDIX A: Glossary

This appendix contains a list of definitions found in the Wildland and Prescribed Fire Management Policy, Implementation Procedures Reference Guide. (National Interagency Fire Center, Boise, ID, June 1998).

Appropriate Management Response. Specific actions taken in response to a wildland fire to implement protection and fire-use objectives.

Best Management Practices (BMP). Techniques to minimize smoke production and impacts. Also called Best Available Control Measures (BACM).

Biological Diversity. The richness, abundance, and variability of plant and animal species and communities, and the ecological processes that link them with one another and with soil, air, and water.

Fire Management Plan (FMP). A strategic plan that defines a program to manage wildland and prescribed fires and documents the fire management program in the approved land-use plan. The plan is supplemented by operational plans such as preparedness plans, preplanned dispatch, prescribed fire plans, and prevention plans.

Fire Management Unit (FMU). Any land management area definable by objectives, topographic features, access, values to be protected, political boundaries, fuel types, or major fire regimes, etc., that set it apart from management characteristics of an adjacent unit. FMUs are delineated in Fire Management Plans or FMPs. These units may have dominant management objectives and preselected strategies to accomplish these objectives.

Hazard Fuels. Excessive live and/or dead wildland fuel accumulations (either natural or created) having the potential for the occurrence of uncharacteristically intense wildland fire (NPS RM-18 – 2001).

Holding Actions. Planned actions required to achieve wildland and prescribed fire management objectives. Specific holding actions are developed to preclude fire from exceeding the MMA (or allowable area).

Initial Attack. An aggressive suppression action consistent with firefighter and public safety and values to be protected.

Management Action Points. See Trigger Points.

Manual. The use of hand-operated power tools and hand tools to cut, clear, or prune herbaceous and woody plants. Hand tools such as the handsaw, axe, shovel, rake, machete, and hand clippers are used in manual treatments. Manual treatments may be considered stand-alone or be followed by burning.

Maximum Manageable Area (MMA). The firm limits of management capability to accommodate the social, political, and resource impacts of a wildland fire. Once established as part of an approved plan, the general impact area is fixed and not subject to change. If MMAs are developed after ignition, they would be defined during the Wildland Fire Implementation Plan Stage III process. In the event a fire occurs in a preplanned MMA and the local unit determines that this MMA is not the best-suited alternative for present conditions, a new MMA can be developed as part of the Stage III process. When this occurs, the Stage III MMA becomes the firm limits of the fire and is fixed.

Manual Fuels Reduction (or treatment). Manipulation or removal of fuels to reduce the likelihood of ignition and/or lessen the potential damage and resistance to control. Methods include, but are not limited to, lopping, chipping, crushing, piling and burning, thinning, and hand removal.

Minimum Impact Management Techniques (MIMT). The application of strategy and tactics that effectively meet suppression fire use, and resource objectives with the least environmental, cultural, and social impacts.

Minimum Requirement. Minimum requirement is a documented process the NPS will use for the determination of the appropriateness of any proposed actions affecting *wilderness*. Minimum tool means the use or activity, determined to be necessary to accomplish an essential task, which makes use of the least intrusive tool, equipment, device, force, regulation, or practice that will achieve the wilderness management objective.

Mitigation. Actions taken to eliminate hazards or reduce their risk(s).

Mitigation Actions. Those on the ground activities that would serve to increase the defensibility of the MMA; check, direct, or delay the spread of fire; and minimize threats to life, property, or resources. These actions would be used to construct firelines, reduce excessive fuel concentrations, reduce vertical fuel continuity, create fuel breaks or barriers around critical or sensitive sites or resources, create "blacklines" through controlled burnouts, and to limit fire spread and behavior.

Natural Fire/Natural Ignition. Any fire started by a natural ignition source (i.e. lightning) as opposed to accidental or intentional ignitions or fires set by humans.

Preparedness. Activities that lead to a safe, efficient, and cost-effective fire management program in support of land and resource management objectives through appropriate planning and coordination.

Prescribed Fire. Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements must be met before ignition.

Prescription. Measurable criteria that define conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required

actions. Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social, or legal considerations.

Risk. Chance of hazard or bad consequences; exposure to chance of injury or loss. Risk level is expressed in terms of hazard, probability and severity.

Severity. The expected consequence of an event in terms of degree of injury, property damage, or program impairment that could occur.

Trigger Points. Either geographic points on the ground or specific points in time where an escalation or alteration of management actions is warranted. These points are defined and the management actions to be taken are clearly described in an approved Wildland Fire Implementation Plan (WFIP) or Prescribed Fire Plan. Timely implementation of the actions when the fire reaches the action point is generally critical to successful accomplishment of the objectives.

Values. Areas where losses from wildland fire would be unacceptable. Values may include cultural resources, developments, inholdings, sensitive habitats, endangered species, watersheds, nearby urban structures, and adjacent land.

Wildfire. An unwanted wildland fire that management treats with suppression oriented tactics. All arson or accidental human caused fires are unwanted wildfires. The determination to treat lighting-caused fires as unwanted wildfires, and to suppress them, is made according to the start location in the fire management units and the associated decision matrix that evaluates time of season, fuel moisture, drought conditions, the national fire situation, and other seasonal indices and human life and safety factors. The Wildland and Prescribed Fire Management Policy Implementation Procedures and Reference Guide outlines the flowcharts that are utilized to determine the appropriate management response for a wildland fire.

Wildland Fire. Any nonstructure fire, other than prescribed fire, which occurs in the wildland. This term encompasses fires previously called both wildfires and prescribed natural fires (now termed wildland fire use).

Wildland Fire Implementation Plan (WFIP). A progressively developed assessment and operational management plan that documents the analysis and selection of strategies and describes the appropriate management response for a wildland fire being managed for resource benefits. A full WFIP consists of three stages. Different levels of completion may occur for differing management strategies (i.e., fires managed for resource benefits would have two or three stages of the WFIP completed, whereas some fires that receive a suppression response may only have a portion of Stage I completed).

Wildland Fire Situation Analysis (WFSA). A decision-making process that evaluates alternative management strategies against selected safety, environmental, social, economic, political, and resource management objectives.

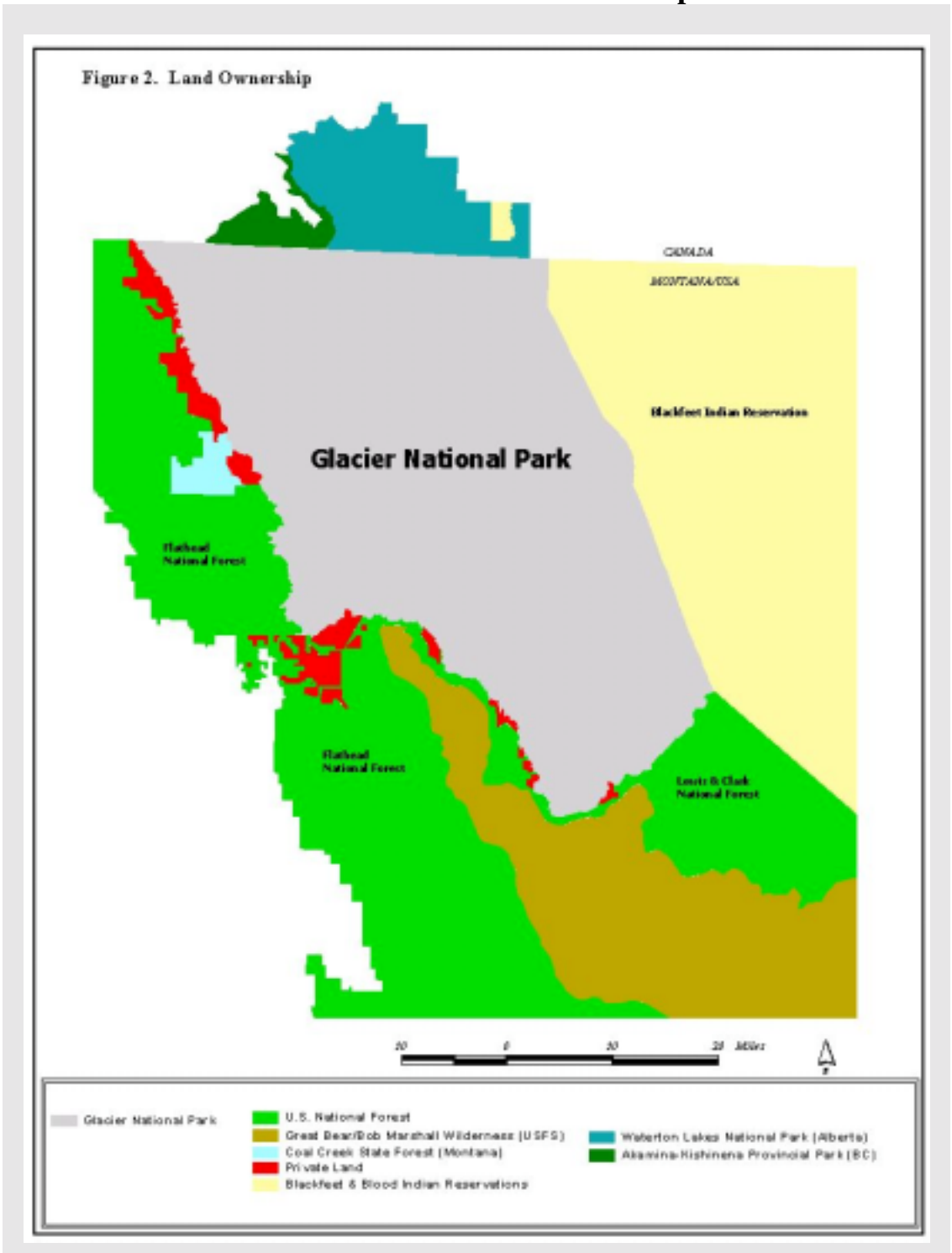
Wildland Fire Suppression. An appropriate management response to wildland fire that results in curtailment of fire spread and eliminates all identified threats from the particular fire. All wildland fire suppression activities provide for firefighter and public safety as the highest consideration but minimize the loss of resource values, economic expenditures, and/or the use of critical firefighting resources.

Wildland Fire Use. The management of naturally ignited wildland fires to accomplish specific, prestated resource management objectives in predefined geographic areas outlined in FMPs. Operational management is described in the WFIP. Wildland fire use is not to be confused with "fire use," which is a broader term encompassing more than just wildland fires.

Wildland Fuels. Combustible materials that can be consumed by fire which includes naturally occurring live and dead vegetation.

Wildland-Urban Interface. That line, area, or zone where structures and other human development meets or intermingles with undeveloped wildland or vegetative fuels.

APPENDIX B: Land Ownership



APPENDIX C: Section 7 Species List

GLACIER NATIONAL PARK
THREATENED AND ENDANGERED SPECIES

In accordance with section 7 (c) of the Endangered Species Act, the USFWS (December 5, 2002) has determined that the following threatened, endangered, and proposed species may occur in the vicinity of the proposed action:

USFWS Status	Species	Scientific Name	Status in GNP
Threatened	**bald eagle**	*Haliaeetus leucocephalus*	
	bull trout	*Salvelinus confluentus*	Present
	Canada lynx	*Felis canadensis*	Present
	grizzly bear	*Ursus arctos*	Present
	Spalding's campion	*Silene spaldingii*	Not known to be present, suitable habitat may exist in the park
	water howellia	*Howellia aquatilis*	Not known to be present, suitable habitat exists in the park
Endangered	**gray wolf**	*Canis lupus*	Present
Candidate	**slender moonwort**	*Botrychium lineare*	Present
Petitioned	**westslope cutthroat trout**	*Oncorhynchus clarki lewisi*	Present
	wolverine	*Gulo gulo*	Present

APPENDIX D: Species of Special Concern

The following are plant, moss, lichen and wildlife species of special concern for Glacier National Park according to the Montana Natural Heritage Program (MNHP; Heidel 2001). The rank for these species includes the global and state ranks by the MNHP.

Vascular Plant Species of Special Concern

G= global status; S=state-wide status; T= rank for subspecific taxon; Q = taxonomic questions involved
1 = Critically imperiled (< 5 occurrences) because of extreme rarity or because of some factor of its biology making it especially vulnerable to extinction.
2 = Has demonstrable factors making it vulnerable to extinction throughout its range (6 to 20 occurrences).
3 = Either very rare or local throughout its restricted range (21 to 100 occurrences) or vulnerable to extinction because of other factors.
4 = Apparently secure, though it may be quite rare in parts of its range, especially at the periphery.
5 = Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery.

Common Name	Scientific Name	Habitat	Rank
round-leaved orchis	***Amerorchis rotundifolia***	along streams and in wet woods, usually with good drainage, often on limestone	G5/S2S3
lyre-leaf rockcress	*Arabis lyrata var. kamchatica***	open, rocky slopes in montane and subalpine zones	G5T5/S2
wavy moonwort	*Botrychium crenulatum*	wet mossy areas, meadows, stream bottoms, around seeps, on edges of marshes, and in wet roadside swales	G3/S2
western moonwort	*Botrychium hesperium*	grasslands or low vegetation in gravelly soils in the valleys and foothills	G3/S2
mountain moonwort	*Botrychium montanum*	deep litter of springy, mature forests; also in riparian thickets, mesic meadows, and grassy trail edges where there is little vegetated cover	G3/S3
pale moonwort	***Botrychium pallidum***	fescue grasslands in the valley zone	G2G3/S1
peculiar moonwort	***Botrychium paradoxum***	near lakeshores, open meadows, and in dense stands of tall herbs in foothill and subalpine zones, often on disturbed sites near the Continental Divide	G3/S2
few-seeded bittercress	*Cardamine oligosperma var. kamtschatica***	moist, sparsely vegetated cliffs at talus slopes above timberline	G5/S1
creeping sedge	*Carex chordorhiza*	sphagnum bogs at low elevations	G5/S2
maritime sedge	*Carex incurviformis var. incurviformis*	wet rock ledges and small streams above treeline	G4G5T4T5/S1
lens-fruited sedge	*Carex lenticularis var. dolia***	wet meadows and boggy ground, along ponds and shallow streams	G5T3Q/S2
pale sedge	***Carex livida****	cold, calcareous, poorly drained lowlands and wet peaty ground at low elevations in foothill and submontane zones, shade intolerant.	G5/S3
rock sedge	***Carex petricosa***	barren, stony, limestone soils	G4/S1
beaked sedge	***Carex rostrata***	organic soils of fens and floating peat mats	G5/S1
thin-flowered sedge	***Carex tenuiflora***	in montane zone around 5,000-foot elevation	G5/S1
bright sedge	***Carex tincta***	meadows, open woods, sloughs, and roadsides	G4G5/SU
pink corydalis	***Corydalis sempervirens****	rocky, dry soils of eroding or disturbed slopes, frequently after a burn	G4G5/S1
spotted lady-slipper	***Cypripedium passerinum***	moist to wet forest at low elevations, sand-dune complexes, and near streambanks and lakeshores; prefers open habitat than shade	G4G5/S2
mountain bladder fern	***Cystopteris montana***	moist areas in the mountains at mid to high elevations	G5/SH
Alaskan clubmoss	***Diphasiastrum sitchense***	meadows and open rocky places at mid to high elevations	G5/S3
dense-leaf draba	***Draba densifolia***	gravelly and stony, open soil of rocky slopes and exposed ridges from the mid-montane to alpine zones	G5/S2
Macoun's draba	***Draba macounii***	moist to wet areas of cool, slopes, outcrops and streams above treeline	G3G4/S1
English sundew	***Drosera anglica***	with moss in wet, organic soils of fens, swamps and bogs in the montane zone	G5/S2

Common Name	Scientific Name	Habitat	Rank
buckler fern	***Dryopteris cristata***	moist forest, thickets, marshes, swamps, and sphagnum bogs at low elevations	G5/S2
northern wildrye	***Elymus innovatus***	sandy meadows, riparian areas, rocky hillsides, and in open lodgepole or spruce forests	G5/S1
giant helleborine	***Epipactis gigantea***	open, wet sites, and in mossy shady areas along rivers, streams, meadows, seeps, and hanging gardens from warm desert shrub to spruce communities	G4/S2
Lackschewitz' fleabane	***Erigeron lackschewitzii***	gravelly, calcareous soil/talus on ridgetops at mid to high elevations.	G3/S3
slender cottongrass	***Eriophorum gracile***	in wet, organic soil of fens at mid to high elevations	G5/S2
northern eyebright	*Euphrasia arctica var. disjuncta*	in alpine bogs, moist peaty soil, streambanks, and other wet places	G5/S1
viviparous fescue	***Festuca vivipara*****	moist to wet alpine turf often on slopes between 7,000-8,000 feet	G4G5Q/S2
glaucous gentian	***Gentiana glauca*****	wet to boggy soils of rock ledges at or above treeline	G4G5/S1
Macoun's gentian	***Gentianopsis macounii***	Boggy soil of wet meadows and fens in the foothill zone	G5/S1
northern rattlesnake-plantain.	***Goodyera repens***	shade-loving species found in cool, coniferous forests, usually with a mossy understory	G5/S3
bractless hedge-hyssop	***Gratiola ebracteata***	drying mud around ponds in the foothills and on the plains	G4/S1
three-flowered rush	***Juncus albescens***	peatlands and moist, well-developed turf and gravelly soils along streams and seeps in the alpine zone	G5/S2
pale laurel	***Kalmia polifolia***	in peat-lands, including spruce forest and outer lake margins in the montane zone	G5/S1
simple kobresia	***Kobresia simpliciuscula***	moist, organic soils in alpine turf on exposed slopes	G5/S2
pinewoods sweetpea	***Lathyrus bijugatus***	open ponderosa pine and western larch forests at low to mid elevations	G4/S1
ground pine	*Lycopodium dendroideum*	low elevations in moist, montane forest	G5/S1
running pine	***Lycopodium lagopus*****	turf along moist slopes at mid to high elevations	G?/S1
short-flowered monkeyflower	***Mimulus breviflorus*****	Vernally moist soil among rock outcrops in coniferous forests or grasslands at mid elevations	G4/S1
adder's tongue	***Ophioglossum pusillum***	wet meadows, margins of fens, and gravelly moist soil at low to mid elevations	G5/S2
stalked-pod crazyweed	***Oxytropis podocarpa***	exposed rocky alpine ridges or turfy alpine hillsides, often on limestone substrates	G4/S1
alpine glacier poppy	***Papaver pygmaeum***	rocky, open slopes at high elevations	G3/S3
palmate-leaved coltsfoot	***Petasites frigidus var. nivalis*****	wet forested areas	G5/S1
Banff loose-flowered bluegrass	***Poa laxa ssp. banffiana*****	mudstone slopes and alpine turf at high elevations	G5?T1/ S1
Austin's knotweed	*Polygonum douglasii ssp. austinae*	open, graveled, often shale-derived soil of eroding slopes and banks in montane zone	G5T4/ S2S3
blunt-leaved pondweed	*Potamogeton obtusifolius*	shallow waters from low to high elevations	G5/S2
five-leaf cinquefoil	*Potentilla quinquefolia*	dry, gravelly soil of windswept ridges and slopes in the alpine zone	G5T4/S2
one-flowered cinquefoil	*Potentilla uniflora*	open, gravelly slopes and ridgetops at high elevations	G5/S1
heart-leaved buttercup	***Ranunculus cardiophyllus***	moist meadows in the foothill zone	G4G5/S2
northern buttercup	***Ranunculus pedatifidus***	moist meadows, grasslands, alpine tundra, or open, rocky soil on windswept ridges; grows best in calcareous regions	G5/S1
timberline buttercup	*Ranunculus verecundus*	meadows, moraines, open slopes and ridges, often in gravelly areas at treeline	G5/S2
arctic pearlwort	*Sagina nivalis*****	moist, open, gravelly soil in the alpine zone	G5/S1
Barratt's willow	*Salix barrattiana*	boggy meadows, moist open hillsides in mountains, and along lakeshores and streambanks	G5/S1
autumn willow	*Salix serissma*	cold, often calcareous bogs at low to mid elevations	G4/S2
pod grass	*Scheuchzeria palustris*	wet, organic soil of fens and bogs at low to mid elevations	G5/S2

Common Name	Scientific Name	Habitat	Rank
tufted club-rush	*Scirpus cespitosus*	wet meadows and bogs at low to high elevations	G5/S2
Hudson's Bay bulrush	***Scirpus hudsonianus****	wet meadows and springs at low to mid elevations	G5/S1
water bulrush	***Scirpus subterminalis***	submerged in rivers, ponds, lakes, streams, and standing water up to 3 or 4 feet deep at low elevations	G4G5/S2
small-flowered groundsel	***Senecio pauciflorus***	moist meadows and cliffs at mid elevations	G4G5/S1
northern beechfern	***Thelypteris phegopteris***	boreal, wet temperate, cool mesothermal climates on moist, calcareous cliff crevices or moist banks in rich, damp forest floors	G5/S2
little false asphodel	***Tofieldia pusilla****	moist, often shallow soils in alpine areas	G5/S2
cushion townsendia	*Townsendia condensata*	open, rocky, soil of exposed slopes and ridgetops at mid to high elevations	G4/S2
flat-leaved bladderwort	***Utricularia intermedia***	shallow, standing, or slow-moving water	G5/S1
velvetleaf blueberry	***Vaccinium myrtilloides***	moist to rather dry forests in the montane zone	G5/S1

* only locations in the western US
** only location(s) in Montana
*** only location for the northern Rocky Mountains

Moss Species of Special Concern

1 = Potentially critical imperiled because of both species and habitat rarity (3 or fewer collections and highly restricted to rare habitat).
2 = Potentially imperiled because of both species and habitat rarity (20 or fewer collections and highly restricted to rare habitat).
H = Historically known only from records before 1925; may be rediscovered.

Scientific Name	*Habitat*	*Rank*
Brachythecium turgidum	partially submerged in pond on tundra	G4/S1
Bryum lonchocaulon	moist, peaty soils	G5?/S1
Bryum pallens	on soil or rocks	G4G5/S1
Bryum schleicheri	wet rock surfaces	G5?/S1
Dichodontium olympicum	wet rock surfaces and soil	GU/S1
Dicranella grevilleana	moist shaded banks	G2G4/S1
Dicranella heteromalla	moist peaty slight slopes	G5?/S1
Dicranum fragilifolium	moist shaded banks and slopes and on rotting wood	G4G5/S1
Distichium inclinatum	rock surfaces	G4G5/S1
Grimmia mollis	rock and occasionally tundra	G3G5/S1
Kiaeria blyttii	rock at mid to high elevations	G5/S1
Kiaeria starkei	peaty soils, stream edges, ledges and banks	G5/S1
Meesia longiseta	in swamps and sphagnum bogs	G4?/S1
Meesia triquetra	moist to wet soils	G5/S2
Meesia uliginosa	peaty or calcareous soils, fens, and in wet depressions at high elevations.	G4/S1
Myurella tenerrima	soil, cliffs, banks and overhangs; fens at mid elevations	G3G4/S1
Neckera douglasii	Lakeshore	G4/S1
Paludella squarrosa	fens, springs, meadows and seeps in tundra at high elevations	G3G5/S1
Paraleucobryum enerve	acidic tundra, often in depressions and at the top of rock outcrops at high elevations	G5?/S1
Paraleucobryum longifolium	acidic tundra and on rock outcrops at high elevations	G5/S1
Plagiobryum demissum	wet rock	G3G5/S1
Plagiobryum zierii	wet rock	G3G4/S1

Pohlia drummondii	wet to moist soils including clay at mid to high elevations	G3G4/S1
Pohlia obtusifolia	cold, wet soil such as the edge of snowfields	G2G4/S1
Pseudocalliergon turgescens	wet rock in alpine zone	G3G5/S1
Schistostega pennata	moist to wet dark places such as caves and overturned bases of trees	G4/S1
Sphagnum centrale	fens and bogs at low to high elevations	G5/S1
Sphagnum contortum	fens and bogs at low to high elevations	G5/S1
Sphagnum girgensohnii	fens and bogs at low to high elevations	G5/S1
Sphagnum magellanicum	fens and bogs at low to high elevations	G5/S1
Stegonia latifolia	dry soil	G3G5/S1
Tayloria lingulata	fens, preferably slightly acidic, at high elevations	G3G5/S1
Tayloria serrata	dung, decomposing wood, and soil	G4/S1
Thamnobryum neckeroides	rock in the alpine zone	G?/SH
Tortula norvegica	wet soils and rocks in the alpine zone	G5/S1

Lichen Species of Special Concern

Scientific Name	*Habitat*	*Rank*
Bryoria subdivergens	alpine sod at high elevations	G2/S2
Collema curtisporum	bark of Populus species	G3/S2

Wildlife Species of Concern

The Species of Concern list for Glacier National Park includes species that are listed as "Species of Special Concern" by the Montana Natural Heritage Program, "Priority Species" by Partners in Flight, and "Sensitive Species" by the U.S. Forest Service (USFS).

Boreal Toad (*Bufo boreas*)

Boreal toads are primarily terrestrial and highly mobile making them sometimes difficult to detect during field surveys. Adults may also exhibit a seasonal shift toward nocturnal behavior or seek refuge from hot, dry conditions by burrowing in the ground litter or inside rodent holes. Serious declines of this species throughout portions of its southern range are cause for concern over its status in other regions. Boreal toads were found in most of the major drainages in the Park excepting portions of the North and Middle Fork, Flathead River drainages. Breeding populations of boreal toads do not often occur in the vicinity of predatory fish populations (Marnell 1997). A large breeding population of boreal toads occurs in the vicinity of the Two Medicine developed area.

Tailed Frog (*Ascaphus truei*)

The tailed frog is mostly nocturnal and highly aquatic dependent, occurring in cold turbulent headwaters streams with cobble substrates (Marnell 1997). Populations of this species in Glacier are disjunct This species is vulnerable to habitat alteration associated with industrial/recreational development (Joslin and Youmans 1999). Removal of streamside vegetation and increases in fine sediments can negatively affect tailed frog recruitment and survival. Tailed frogs in Glacier can apparently co-exist with fish in streams where abundant escape cover exists, the fishery is primarily lacustrine, and the fish are non-predatory (Marnell 1997). Tailed frogs have been observed in very few areas of the Park, with most records coming from the McDonald and Two Medicine Valleys and the Middle Fork, Flathead River drainage (USGS files, Marnell 1997). This species is difficult to detect during surveys due to its nocturnal behavior, and may be more common than current data indicate (Leo

Marnell, USGS, pers. comm.). Breeding activity has been documented in the Park, but population trend is currently unknown.

Northern Bog Lemming (*Synaptomys borealis*)

Northern bog lemmings are rare residents of wet meadows, bogs, and marsh borders. They typically inhabit sphagnum bogs and fens, but are also found in mossy forests, wet sub-alpine meadows and alpine tundra. Boreal in distribution, northern bog lemmings occur in North America from near treeline in the north, south to Washington, Idaho, Montana, Minnesota, and New England (Reichel 1995). There are only 16 known populations of bog lemmings in Montana, six of which are located on the west side of the Continental Divide in Glacier National Park, in the McDonald and North Fork drainages (MT Nat. Her. Program database). The northern bog lemming is rarely trapped and very little is known about its population status and life history. The disjunct nature of Montana's relict populations has generated concern over the viability of the northern bog lemming in the southern portion of its range. Surveys for northern bog lemmings have not been conducted on a Park-wide basis, but all sphagnum and fen/bog moss habitat patches are considered suitable habitat and should be preserved to maintain viable populations of northern bog lemmings (Reichel 1995). Breeding has been documented but population trend is unknown.

Swift Fox (*Vulpes velox*)

The swift fox, a housecat-sized mammal that preys mostly on grasshoppers and ground squirrels, was historically common throughout the Great Plains and along the eastern border of Glacier National Park. Records from the fur trade along the Upper Missouri River show that 8,500 swift fox pelts were taken between 1835 and 1838 (Knowles et al. 1998). By 1969, the species was declared extinct in Montana. Since 1998, annual releases of captive-bred swift foxes from Canada have occurred on the Blackfeet Indian Reservation just east of Glacier National Park as part of a multi-year reintroduction program. Survivorship has been high and successful denning has been observed every year (Minette Johnson, Defenders of Wildlife, pers. comm.). This population of swift foxes on the Blackfeet Indian Reservation is the only known reproducing population in the state of Montana. Threats to swift foxes include trapping/shooting, deteriorating range conditions, vehicle-caused mortality, rodent control programs, pesticide use, and predation by coyotes which have become unnaturally abundant in the absence of wolves. Swift foxes are rare visitors to the fescue grasslands along the east side of the Park. Denning has not been observed in the Park, but hunting has been documented (GNP files). Sightings have occurred in the St. Mary and Cut Bank valleys (GNP files).

Fisher (*Martes pennanti*)

Fishers are residents of coniferous forests and riparian areas. Breeding in the Park is probable but the population status and trend are unknown. Fisher were probably eliminated from Montana, as there were no trapping records for the state from 1920-1960. In 1950-60, fisher were transplanted from British Columbia to Montana, but population numbers remain low (Powell, and Zielinski 1994). Fisher inhabit moist coniferous forests and prefer mature stands with abundant small mammal prey. They generally frequent drainage bottoms, lower slopes, and riparian areas (Powell, and Zielinski 1994). Fisher have been documented on both sides of the Continental Divide in Glacier including; the St. Mary, McDonald, Two Medicine and Many Glacier drainages (GNP files).

Wolverine (*Gulo gulo*)

The wolverine is a rare resident of coniferous forests and alpine meadows, on both sides of the Continental Divide. Breeding has been documented but population status and trend are unknown. Wolverine were apparently extirpated from Montana by 1920 due to overharvest, but recovered through dispersal from Canada and Glacier National Park (Newby and Wright 1955). Wolverine appear to require large, isolated tracts of wilderness supporting a diverse prey base. They utilize a range of habitats including alpine areas, mature forest, ecotonal areas, and riparian areas. Wolverines exhibit a distinct seasonal elevational pattern moving to lower elevations during the winter where they search for carrion on ungulate winter ranges. A limiting factor to wolverine distribution may be the availability of suitable denning habitat. Wolverine appear to require remote alpine cirques for denning and are especially sensitive to human disturbance during courtship, denning and rearing of young (Copeland 1996). Glacier is considered to have very high quality wolverine habitat due to its extensive alpine areas, rugged topography, remoteness, and diverse ungulate populations. Removal of large predators such as wolves and mountain lions from an ecosystem can reduce the amount of carrion available to wolverine. Wolverine have been detected across elevational gradients in most Park drainages with sightings

concentrated in the Two Medicine, St. Mary, McDonald, and Many Glacier drainages (Yates et al. 1994, Hahr et al. 1999, Hahr et al. 2000).

Rocky Mountain Bighorn Sheep (*Ovis canadensis*)

Historically common throughout the Rocky Mountains, bighorn sheep experienced severe population declines in the early 1890s probably due to disease (transmitted through contact with domestic sheep) and over-harvest. Although current population levels are higher because of reintroductions and hunting regulations, much of historic bighorn sheep range is still unoccupied (Wisdom et al. 2000). While travelling through what is now the east side of Glacier National Park in the late 1880s, naturalist and big game hunter George B. Grinnell concluded that bighorn sheep "are so plenty that they are to be found on every peak." Despite the high level of protection awarded Glacier's wildlife, the Park's bighorn sheep population has nonetheless been affected by periodic disease and illegal hunting (GNP files). The Park's bighorn sheep population has recently been estimated between 400 and 450 individuals (Gordon Dicus, GNP, personal communication). Assessing historic bighorn sheep population trends in GNP has proven difficult due to unreliable population estimates prior to the 1970s (Keating 1985). Data suggest that bighorn sheep no longer utilize some areas in Glacier where they occurred in the 1930s (Keating 1985).

Glacier's bighorn sheep primarily range along the crest of the Continental Divide and along the peaks and ridges to the east. The east side of the Park provides excellent winter range because the strong winds and sparse vegetation leave the south facing slopes relatively snow-free in winter. Source habitats for bighorn sheep are found mostly in the alpine and subalpine areas where open habitats and high-quality forage exist. Cliffs and steep, rocky terrain are two important habitat features that sheep require for predator avoidance and escape. Post-fire habitats also benefit sheep by increasing visibility and improving forage (Wisdom et al. 2000). Bighorn sheep exhibit seasonal movement patterns between winter, summer, and transitional ranges used for lambing and rutting. If access to these areas is restricted due to habitat fragmentation or direct human disturbance, bighorn sheep may shift their distribution, or experience increased physiological stress (Wisdom et al. 2000). Bighorn sheep are especially sensitive to disturbance during lambing (late April to early June). Knowledge of seasonally important habitats and critical travel routes is passed down from generation to generation. Loss of this knowledge due to local extirpations could preclude the recolonization of suitable habitat for a considerable period of time (Geist 1971). Year-round sheep range occurs in the St. Mary, Two Medicine and Many Glacier drainages (GNP files).

Townsends' Big-Eared Bat (*Corynorhinus townsedii*)

Townsends' big-eared bats depend on caves and cave-like structures for nursery colonies, day roosts, and hibernacula. This species is a forest generalist within the subalpine, montane woodland, shrubland and riparian community groups (Nagorsen and Brigham 1993). Because of their restrictive habitat requirements, Townsends' big-eared bats have a patchy distribution. Alteration and disturbance of roost structures, exposure to pesticides, changes in insect prey populations, and shooting are the main threats to Townsends' big-eared bat populations in western North America (Wisdom et al. 2000). Although no records exist for this species in Glacier National Park, there are records from adjacent lands in Flathead, Glacier, and Lincoln Counties and in British Columbia, Canada (Paul Hendricks, MT Nat. Herit. Prog., pers. comm.). Occurrence of this species in the Park has not been verified, in part, because extensive bat surveys have never been conducted.

Silver-Haired Bat (*Lasionycteris noctivagans*)

Silver-haired bats are known to occur in forested areas and woodlands on both the east and west sides of the Glacier National Park, including the McDonald Valley. This species shows a preference for late-successional stages of subalpine, montane, and riparian woodland community groups (Wisdom et al. 2000). Silver-haired bats use contrasting habitats- forested areas for roosting and open areas for foraging. Large diameter snags and live trees are used for roosting (Christy and West 1993), and shrubs, herbaceous wetlands, and riparian areas are special habitat features necessary for this species. A lack of information has made as assessment of this species' status in Northwest Montana and Glacier National Park difficult. Extensive bat surveys have not been conducted in the Park and population status and trend are unknown.

Hoary Bat (*Lasiurus cinereus*)

Hoary bats are known to occur rarely in forested areas and woodlands on both the east and west sides of Glacier National Park. This species shows a preference for late-successional stages of subalpine, montane and riparian

woodland community groups. Hoary bats also use younger stands of all montane, and lower montane forest types and aspen and cottonwood-willow for foraging (Wisdom et al. 2000). The hoary bat is an edge-associated species often roosting in deciduous trees or conifers at the edge of clearings (Wisdom et al. 2000). A lack of information has made as assessment of this species' status in Northwest Montana difficult. Extensive bat surveys have never been conducted in Glacier National Park and population status and trend is unknown.

Great Gray Owl (*Strix nebulosa*)

The great gray owl is a rare resident in mature and old-growth coniferous forest with nearby meadows for foraging and nesting. Great gray owls are a contrast species, requiring the juxtaposition of habitats used for foraging and for nesting/roosting. Snags are a special habitat feature for great gray owls. Great gray owls do not build their own nests but rely instead on large abandoned stick nests and platforms such as the broken tops of large-diameter trees. Great gray owls are widely distributed, although at low population levels, in most forested areas in Northwest Montana (Wisdom et al. 2000). The maintenance of snag structures, meadow systems, and prey populations is necessary for the persistence of great gray owl populations (Hayward 1994a). Nesting has been documented in the Park but status is unknown.

Boreal Owl (*Aegolius funereus*)

The boreal owl is a rare resident in mature forests and unmanaged younger forests, especially subalpine and montane forests and riparian woodlands. Snags or large trees with either natural cavities or cavities excavated by other species are used by boreal owls for nesting (Hayward 1994b). Forests that include large amounts of decaying woody material near the ground and associated lichens and fungi, support populations of the boreal owls principal prey, red-backed voles (*Clethrionomys gapperi*). Boreal owls may occur in a patchy geographic pattern making the proximity of neighboring populations crucial to the long-term persistence of the local population (Hayward 1994b). Very few areas of the Park have been surveyed for owls. Boreal owls were detected in the McDonald, Two Medicine, Cutbank, and North Fork, Flathead River drainages (NPS files). Nesting has been documented but population trend is unknown.

Peregrine Falcon (*Falco peregrinus*)

The U.S. Fish and Wildlife Service removed the peregrine falcon from the list of threatened and endangered species in 1999. Although no longer endangered, peregrine falcons, their eggs, parts, and nests will continue to be protected from unauthorized killing, possession, transportation, and importation by the Migratory Bird Treaty Act (1918). Also, the species will continue to be monitored across the nation for the next 13 years to provide data on at least two generations of peregrines and to ensure that the bird is doing well after being delisted. Peregrine falcons are rare in the Park, though sightings are reported nearly every year, occasionally during the nesting season. There have been no recorded peregrine nests in the Park. Surveys of potential peregrine falcon nesting habitat began in 1989 and were completed in 1991. Peregrine falcon habitat has been documented in many areas of the Park (Yates et al.1991).

Northern Goshawk (*Accipiter gentilis*)

Northern goshawks are uncommon from spring to fall in forested areas, especially in mature to old-growth coniferous and mixed forests in the Park. Adult goshawks generally remain on their territories throughout the year, although they may shift to lower elevations in the fall. Goshawks require large nest trees in dense stands to support their bulky nest structures, and prefer to forage in small openings or dense stands with relatively open understories (Hayward 1983). Goshawks have been observed throughout the Park, but only a handful of nests have been documented. Goshawk surveys have been conducted in the St. Mary Valley only. Many sightings have occurred in the McDonald, St. Mary and Many Glacier drainages (GNP files).

Golden Eagle (*Aquila chrysaetos*)

Golden eagles are fairly common in open areas of the Park from spring to fall. They nest in cliffs (and possibly trees) throughout the Park including the McDonald, North Fork, Middle Fork, St. Mary, Two Medicine, Waterton, and Many Glacier drainages (GNP files). Specific nests have been located and monitored in Glacier National Park, but population status and trend is currently unknown (Yates et al. 1991, Sumner and Schmidt 1998, Sumner and Gilbert 1999). The Many Glacier Valley has one of the densest nesting populations of golden eagles known in the lower 48 states (M. Britten, NPS, pers. comm.).

Productivity for golden eagles in Montana has been low and may be declining (Joslin and Youmans 1999). Golden eagles may be disturbed during the nesting season by human intrusion, resulting in lowered productivity due to disruption of courtship activities, over-exposure of eggs or young birds to weather, and premature fledging of juveniles. Direct mortality of juveniles due to starvation or predation is also possible if adults are displaced from the area and regular nest attendance does not occur (Fyfe and Olendorff 1976).

Golden eagle migration through Glacier National Park has been documented as thousands of eagles travel north to nesting areas in spring and south to wintering areas in autumn (Yates 1994, Yates et al. 2001). The Livingston and Lewis Mountain Ranges, and connecting spur ridges, are used by migrating eagles during these periods and the importance of the travel corridor is still under investigation.

Harlequin Duck (*Histrionicus histrionicus*)

Harlequin ducks are fairly common from spring to fall in fast moving water (streams and rivers) and less frequently on lakes. Productivity is highly variable. Harlequin duck declines have been documented throughout the western populations, including in Montana, where there are approximately 110 pairs (Genter 1993). Approximately 20 percent of the Montana population breed in Glacier National Park (Genter 1993). Upper McDonald Creek, with about 25 pairs, is considered the most critical harlequin breeding stream in Montana (Ashley 1998). Harlequins winter in coastal areas and migrate inland during summer to nest along clean, fast-flowing mountains streams and rivers where they can breed and nest away from human disturbance (Clarkson 1994). Recreational boating, sport fishing and other human activities have been shown to displace harlequin ducks especially during nesting and brood rearing periods (Clarkson 1994). Spring boating closures to protect harlequins from disturbance are in effect on several essential harlequin breeding streams in the Park. In addition to the McDonald Valley, harlequin pairs and/or broods have also been documented in the Two Medicine, Many Glacier and St. Mary drainages (NPS files). Dr. Grinnell reported seeing a female and brood of six young in the Many Glacier drainage in the early 1900s (Bailey and Bailey 1918), however, no broods have been documented in this drainage since.

Common Loon (*Gavia immer*)

Common loons are often seen between spring and fall on large and small lakes throughout Glacier National Park. A significant proportion of Montana's nesting pairs are found in Glacier making the area especially important for the viability of the state's loon population. Highest productivity occurs among breeding pairs in the North Fork, Flathead River. Since annual Park-wide loon counts were initiated in the late 1980s, breeding has rarely been documented on the east side of the Park, except the Belly River drainage (GNP files). Common loons have been observed on all of the major lakes in the Many Glacier, Two Medicine, St. Mary, and McDonald drainages. Productivity Park-wide appears to have declined since the 1980s (Gniadek, unpublished data 2001). Historic information on common loon distribution and productivity is limited.

Pileated Woodpecker (*Dryocopus pileatus*)

The pileated woodpecker is a fairly common resident of northwestern Montana forests dominated by western larch and Douglas-fir. Pileated woodpeckers depend on large snags for nesting and roosting, and they are associated with old growth forests that experience fire and heartwood decay (McClelland and McClelland 1999). Nesting has been documented in the Park, but population status and trend are unknown (GNP files).

Black-Backed Woodpecker (*Picoides arcticus*)

Black-backed woodpeckers are rare residents of mature to old-growth subalpine, montane, and lower montane forests and riparian woodlands. This species also uses regenerating lodgepole pine forests, burned conifer forests and beetle-infested forests (Caton 1996). Black-backed woodpeckers excavate cavities for nesting in live trees with heart-rot or recently killed trees (Wisdom et al. 2000). The portion of this species' range, which includes Glacier, has experienced strong declines in black-backed woodpecker source habitats due to the decline of mature forests and the altered frequency of stand-replacing fires (Wisdom et al. 2000). This species has been documented in the North Fork and McDonald drainages (GNP files). Nesting has been documented, but population trend is unknown.

Olive-Sided Flycatcher (*Nattallornis borealis*)

Olive-sided flycatchers breed in forested areas of North America and winter in Central and South America. They are a contrast species using mature coniferous forests for nesting and forest openings for foraging. They

are uncommon in Glacier from spring to fall in conifer forests, bogs, and recently burned forest. Nesting has been documented but population trend is unknown. Breeding bird survey data for the interior Columbia River Basin indicate that olive-sided flycatcher populations have declined between 1966 and 1994 (Wisdom et al. 2000). This species has been documented in the St. Mary, McDonald, Many Glacier, and North Fork drainages (GNP files).

Northern Hawk-Owl (*Surnia ulula*)

This species is a rare resident and migrant in recently burned forest. Nesting occurs in large-diameter snags and has been documented in the North Fork Valley but population trend is unknown (NPS files).

Ferruginous Hawk (*Buteo regalis*)

Ferruginous hawks are rare in grassland habitats from spring to fall, and have been documented in the Many Glacier and East Glacier areas. Nesting has not been documented in the Park (GNP files).

Trumpeter Swan (*Cygnus buccinator*)

Trumpeter swans are rare on lakes, ponds, rivers and streams during spring and fall migration. Nesting may occur on the east side of the Park. Trumpeter swans are known to nest in Waterton Lakes National Park, Canada, and on adjacent ranch lands in Alberta. Trumpeter swans are often observed in spring and fall at the outlet and inlet of Lake McDonald and along Lake Sherburne at Many Glacier (GNP files).

LeConte's Sparrow (*Ammodramus leconteii*)

This bird is rare from spring to fall in wet meadows, primarily in the North Fork; nesting documented but population trend unknown (GNP files).

American White Pelican (*Pelecanus erythrorhynchos*)

This species is rare during summer adjacent to lower elevation water bodies near the Park boundary on both sides of Continental Divide. Most sightings have occurred on St. Mary Lake, Two Medicine Lake, and Lake Josephine. There is no evidence of breeding in the Park (GNP files).

Black Swift (*Cypseloides niger*)

This species is rare in spring and summer; documented in the McDonald, St. Mary, and North Fork drainages (GNP files).

Black Tern (*Chlidonias niger*)

Uncommon in spring and summer in the North Fork drainage. Also on the eastern boundary of Glacier National Park near the town of Babb, MT (GNP files).

Forster's Tern (*Sterna fosteri*)

Accidental spring visitor to the Park along the east side (GNP files).

Common Tern (*Sterna hirundo*)

Rare in spring and fall along the east side of the Park (GNP files).

Caspian Tern (*Sterna caspia*)

Rare in fall along the east side of the Park (GNP files).

Franklin's Gull (*Larus pipixcan*)

Uncommon on the east and west sides of the Park in spring and summer.

Black-Crowned Night Heron (*Nycticorax nycticorax*)

Accidental visitor on the west side of Glacier.

Loggerhead Shrike (*Lanius ludovicianus*)

Uncommon in spring, summer, and fall east and west of the Continental Divide.

White-Tailed Ptarmigan (*Lagopus leucurus*)

Common year-round in alpine areas of the Park.

Brown Creeper (*Certhia americana*)
Common year-round east and west of the Continental Divide.

Clark's Nutcracker (*Nucifraga columbiana*)
Common year-round east and west of the Continental Divide across elevational gradients. The 90% decline in the whitebark pine population in the Park has generated concern over the status of Clark's nutcrackers, a closely associated species.

The following species are listed as "Partners in Flight Level 2 Species."

Horned Grebe
Common in spring and summer on the east and west sides. Uncommon and rare in fall and winter respectively.

Barrow's Goldeneye
Common in spring, summer, and fall on the east and west sides. Uncommon in winter.

Hooded Merganser
Uncommon in spring, summer, and fall on the east and west sides. Rare in winter.

Ruffed Grouse
Abundant year-round throughout the Park.

Long-Billed Curlew
Uncommon in spring on both sides of the Continental Divide.

Marbled Godwit
Rare in spring on both sides of the Continental Divide.

Vaux's Swift
Common in spring and summer on both sides of the Continental Divide.

Calliope Hummingbird
Common in spring and summer on both sides of the Continental Divide.

Lewis's Woodpecker
Uncommon in spring and summer on both sides of the Continental Divide.

Williamson's Sapsucker
Uncommon in spring and summer on both sides of the Continental Divide.

Three-Toed Woodpecker
Common year-round throughout the Park.

Willow Flycatcher
Common in spring and summer on both sides of the Continental Divide.

Hammond's Flycatcher
Common in spring and summer on both sides of the Continental Divide.

Cordilleran Flycatcher
Uncommon in spring and summer on both sides of the Continental Divide.

Winter Wren
Common in spring and summer on the east and west sides. Uncommon in fall and winter.

Veery
Uncommon in spring, summer, and fall on both sides of the Continental Divide.

Red-eyed Vireo
Uncommon in spring and summer on both sides of the Continental Divide.

Lazuli Bunting
Common in spring and summer on both sides of the Continental Divide.

Brewer's Sparrow
Rare in spring and summer on both sides of the Continental Divide.

Lark Bunting
Rare in summer on both sides of the Continental Divide.

McCown's Longspur
Rare in spring on the east side of the Continental Divide.

Chestnut-Collared Longspur
Uncommon in spring on both sides of the Continental Divide.

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APPENDIX E: Environmental Compliance Requirements

Air Quality. The park will apply for prescribed burning permits from the Montana Department of Environmental Quality - Monitoring Unit in Missoula. The burning seasons and notifications to be followed under Air Quality Bureau requirements are as follows:

- March 1 through August 30 – Major open burning requires a permit from the Department of Environmental Quality. Burners must employ "Best Available Control Policy" (BACT).
- September 1 – November 30 – Major open burning requires a permit from the Department of Environmental Quality (DEQ). Burners are required to call the Smoke Management hotline prior to ignition and to observe burning restriction issued by the DEQ.
- December 1 through February 29 – BACT includes burning only during time periods specified by the DEQ.

Section 7 Consultation for Threatened and Endangered Species. The park has initiated informal consultation with the U.S. Fish & Wildlife Service (USFWS) in accordance with section 7 of the Endangered Species Act. A Biological Assessment will be prepared and submitted to the USFWS. Although the park has determined that the preferred alternative "may affect, is not likely to adversely affect" Canada lynx, formal consultation will be required due to a recent court decision. For bald eagle, bull trout, grizzly bear and gray wolf, the park will request USFWS concurrence with our determination of "may affect, not likely to adversely affect". If new information pertaining to the impacts of the project on listed species becomes available, or if additional species are listed during the project, the park will reinitiate section 7 consultation and will comply with requirements of the Endangered Species Act.

Burned Area Emergency Rehabilitation. After a wildfire, the park will work with a Burned Area Emergency Rehabilitation (BAER) team to develop a BAER plan to prevent impacts to natural resources from rehabilitation work. The USFWS will be involved with this team to address concerns with listed species.

Section 106. The Montana State Historic Preservation Office has requested that the park develop a Programmatic Agreement to protect cultural resources during fire management activities. Until a Programmatic Agreement is completed, the park will conduct section 106 consultation with the Montana State Historic Preservation Office in Helena for each undertaking.

APPENDIX F: Applicable Federal Laws, Executive Orders and Federal Policies

FEDERAL LAWS

Archaeological Resources Protection Act of 1979, as amended

Secures the protection of archaeological resources on public or Indian lands; defines archaeological resources to be any material remains of past human life or activities that are of archaeological interest and are at least 100 years old

PL 96-95, 93 Stat 721, 16 USC 470a et seq.
43 CFR 7, subparts A and B
36 CFR 79

Antiquities Act of 1906

Provides for protection of historic and prehistoric remains "or any antiquity" on federal lands

PL 59-209, 34 Stat 225, 16 USC 431—433
43 CFR Part 3—Preservation of American Antiquities

Bald and Golden Eagle Protection Act

54 Stat 250, 16 USC 668 et seq., originally enacted in 1940
PL 86-70, 73 Stat 143 – June 25, 1959
PL 87-884, 76 Stat 1246 – October 24, 1962
PL 92-535, 86 Stat 1064 – October 23, 1972

Clean Air Act and Amendments of 1977 and 1990

Purpose is to prevent and control air pollution, and prevent major deterioration of areas where air is cleaner than National Ambient Air Quality Standards (NAAQS)

PL 96-95, 91 Stat 685
PL 95-1090, 91 Stat 1399
PL 101-549

Endangered Species Act of 1973, as amended

Requires federal agencies to insure that any action authorized, funded or carried out does not jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modifications of critical habitat

PL 93-205, 87 Stat 884, 16 USC 1531 et seq.
PL 94-325, 90 Stat 724, as amended June 30, 1976
PL 94-359, 90 Stat 911, as amended July 12, 1976
PL 95-212, 91 Stat 1493, as amended December 19, 1977
PL 95-632, 92 Stat 3751, as amended November 10, 1978

Federal Water Pollution Control Act of 1972 (Clean Water Act)

Furthers the objectives of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters and of eliminating the discharge of pollutants into navibable waters

33 USC 1251-1265, 1281-1292, 1311-1328, 1341-1345, 1361-1376; 86 Stat 816, as amended
PL 92-500, 86 Stat 877, 33 USC 1341 et seq.
1987 Federal Water Quality Act

National Environmental Policy Act of 1969, as amended

Establishes as a goal for federal decision-making a balance between use and preservation of natural and cultural resources

42 USC 4321 et seq.
40 CFR 1500-1508

National Historic Preservation Act of 1966, as amended

Establishes the requirement that NPS consider what effects undertakings may have on cultural resources listed in or eligible to be listed in the National Register of Historic Places

PL 89-665, 80 Stat 915-919, 16 USC 470 et seq.
PL 91-243, as amended
PL 93-54, as amended
PL 94-422, Title II, as amended
PL 94-458, as amended
PL 96-199, as amended
PL 96-244, as amended
PL 96-515, 94 Stat 2987, as amended December 12, 1980
36 CFR Parts 60, 61, 63
36 CFR Part 800 – Protection of historic and cultural properties
36 CFR Part 800 Appendix A: Guidelines for making "adverse effect" and "no adverse effect" determinations for archaeological resources in accordance with 36 CFR Part 800

National Park Service Organic Act of 1916 (Organic Act)

Establishes the National Park Service under Department of Interior

PL Chapter 408, 39 Stat 535 et seq., 16 USC 1
PL 64-235, 16 USC ss1, 2-4, as amended

EXECUTIVE ORDERS

E.O. 11593; Protection and Enhancement of the Cultural Environment
36 FR 8921; May 13, 1971
36 CFR Part 800 – Procedures for the Protection of Historic and Cultural Properties
E.O. 11990; Protection of Wetlands

FEDERAL POLICIES

Federal Wildland Fire Policy (2001)

Review and update of the 1995 Federal Wildland Fire Management Policy at the direction of the Secretaries of Agriculture and Interior

NPS Wildland Fire Policy, DO #18 (1998) and RM-18 16 USC 1-4 are the legal authority for this policy

Each park with vegetation capable of burning will prepare a Fire Management Plan to guide a fire management program that is responsive to the park's natural and cultural resource objectives and to safety considerations for park visitors, employees, and developed facilities

NPS Management Policies, Section 4.5 – Wildland Fire Management (revised 2001)

Park fire management programs will be designed to meet park resource management objectives while ensuring firefighter and public safety are not compromised

PROGRAMMATIC AGREEMENTS

Servicewide Programmatic Agreement among the National Park Service, Advisory Council on Historic Preservation, and the National conference of State Historic Preservation Officers (1995)

Programmatic Agreement among the National Park Service, the Advisory Council on Historic Preservation, and the Montana State Historic Preservation Officer for Management of Historic Properties in Glacier National Park, July 1997

APPENDIX G: U.S. Fish and Wildlife Service Consultation

U.S. FISH AND WILDLIFE SERVICE
MONTANA FIELD OFFICE
100 N. PARK, SUITE 320
HELENA, MONTANA 59601
PHONE (406) 449-5225. FAX (406} 449-5339

M.25 NPS Fire Informal

Memorandum November 27, 2001

To: Suzanne Lewis, Superintendent, Glacier National Park, West Glacier, Montana

From: Mark Wilson, Field Supervisor, U.S. Fish and Wildlife Service, Ecological Services, Montana. Field Office, Helena, Montana

Subject: Fire Management Plan for Glacier National Park

In response to your letter received November 5,2001 regarding the development of a new Fire Management Plan (plan) for Glacier National Park, the U.S. Fish and Wildlife Service (Service) has the following recommendations.

We recommend you contact the Service by telephone or facsimile as soon as reasonably possible in the event there is a wildfire within Glacier National Park, whereby you determine that threatened and endangered (T &E) species will be impacted by fire suppression actions or fire suppression rehabilitation activities during the emergency. Under the Endangered Species Act, where emergency circumstances mandate the need to consult in an expedited manner, emergency consultation may be conducted informally through alternative procedures in accordance with CFR Part 402.05 and the Service's Section 7 Consultation Handbook, chapter 8. Please contact Tim Bodurtha (406) 758- 6882 or Leslie Kubin (406) 758-6881 located at our Kalispell sub-office to initiate emergency consultation.

The Service also recommends your Plan address Service involvement with Burned Area Emergency Rehabilitation (BAER) team activities and other post fire rehabilitation work. This will insure that T &E species concerns are addressed during the emergency consultation process in an expedited manner**.** Currently Leslie Kubin would serve as the Service's participant in this process.

Of interest to the Service in your Plan would be the process or procedures to update and address post-fire baseline conditions for T&E species. This is particularly important for pre-fire proposed projects or for on-going projects located in the affected watersheds. For

example, due to the impacts from the 2001 Moose fire there has been a change in the baseline conditions for T &E species, particularly for bul1 trout because extensive riparian areas have been burned. How would this change in baseline conditions affect on-going or proposed projects in those watersheds? A process to update baseline data for all T &E species should be considered when addressing post-fire planning actions in the new Fire Management Plan. If you would like more information on this matter please contact Leslie Kubin.

The Service hopes to continue the interagency coordination that occurred during the Moose fire of 2001. The above recommendations will assist Glacier National Park in fulfilling Section 7 requirements under the Endangered Species Act and facilitate continued coordination and cooperation among our agencies. We look forward to working with you and your staff in the future.

/S/

cc: Flathead National Forest (Don Black, Fire Staff Officer, Kalispell, MT) Kalispell Suboffice

14-02 13,13 **FROM,HQ-GLACIER NATL**

D18
L76-GLAC-00-024

November 2, 2001

U.S. Fish and Wildlife Service
Mark Wilson, Field Supervisor
100 N. Park Avenue, Suite 320
Helena, Montana 59601

Dear MI -Wilson:

We are beginning to develop a Fire Management Plan/Environmental Assessment for Glacier National Park. Our current plan is 11 years old and requires updating. Furthermore, we are planning on developing a joint management plan with the Flathead National Forest, but we will be preparing our own environmental assessment for the portion of the plan that covers Glacier National Park lands.

According to our records the following federally listed species occur within the park.

Status	Name
Threatened:	Grizzly bear (*Ursus arctos horribilis)*
	Bull trout (*Salvelirtus confluentus)*
	Lynx (*Lynx canadensis)*
	Bald eagle (*Haliaeetus leucocephalus)*
	Water howellia (*Howellia aquatillis)*
Endangered:	Gray wolf (*Canus lupus)*
Proposed:	Spalding's catcbfly *(Silene spaldingii)*
	Slender moonwort (*Botrychium lineare**)***

Please inform us if there are other species we need to be concerned with. Public scoping meetings are scheduled for November 13, 2001 in the Browning High School Annex and November 19, 2001, in West Glacier at the Glacier National Park Community Building. Both meetings will run from 6:30-8:00pm. We will also be contacting your staff in Creston to set up a time to meet and discuss this plan and your agency's concerns in more detail. Please call Mary Riddle of my staff at 888-7898 if you have any questions.

Sincerely,

Isl Suzanne Lewis

Suzanne Lewis

Superintendent

Cc: Tim Bodhurtha, Carole Jorgensen USFWS, 780 Creston Hatchery Road, Kalispell. Montana 59901
Bcc; Riddle, GLAC. Gniadek, GLAC. Vanhorn, GLAC, Jobn Lissoway

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
MONTANA FIELD OFFICE
100 N. PARK, SUITE 320
HELENA, MONTANA 59601
PHONE (406) 449-5225, FAX (406) 449-5339

M.25 Glacier NP Informal December 5, 2002

Memorandum

To: Mr. Michael Holm, Superintendent, Glacier National Park, West Glacier, Montana

From: R. Mark Wilson, Field Supervisor, U.S. Fish and Wildlife Service, Ecological Services, Montana Field Office, Helena, Montana

Subject: Reply to request for a list of proposed, threatened, endangered, and candidate species which may be present in Glacier National Park.

This is in response to an informal information request from Allison R. Y. Rowland, Bio-Science Technician - Compliance, which was received in our office on November 20, 2002. Glacier National Park encompasses portions of both Flathead and Glacier Counties, Montana. The following federally listed, proposed, and candidate species and critical habitat may be present in those counties:

Canis lupus	Gray Wolf	LE*
Haliaeetus leucocephalus	Bald Eagle	LT
Ursus arctos horribilis	Grizzly Bear	LT
Silene spaldingii	Spalding's Campion	LT
Lynx canadensis	Canada Lynx	LT
Salvelinus confluentus	Bull Trout	LT
Botrychium lineare	Slender Moonwort	C

* = Listed endangered except in non-essential experimental population areas
LE = Listed Endangered
LT = Listed Threatened
C = Candidate

The water howellia *(Howellia aquatilis)* is listed *threatened* and is found in wetlands in Lake and Missoula Counties, particularly the Swan Valley. However, it has not been documented above 4,400 feet in elevation. Suitable wetlands for water howellia below 5,000 feet elevation may be present in Glacier National Park.

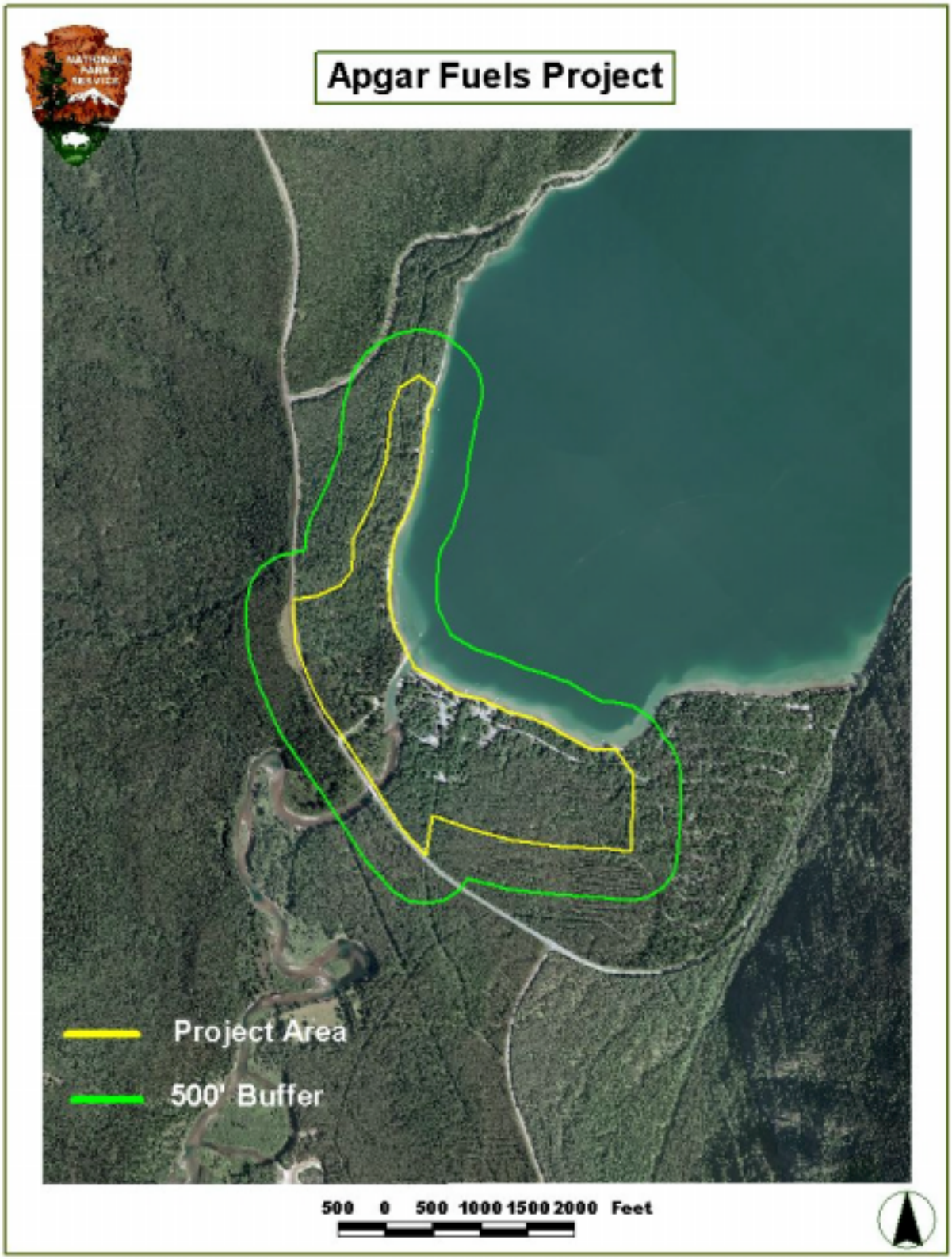
The slender moonwort *(Botrychium lineare) is* a candidate for listing pursuant to the Endangered Species Act of 1973, as amended (Act), and occurs in meadows within coniferous forest in Glacier and Lake Counties.

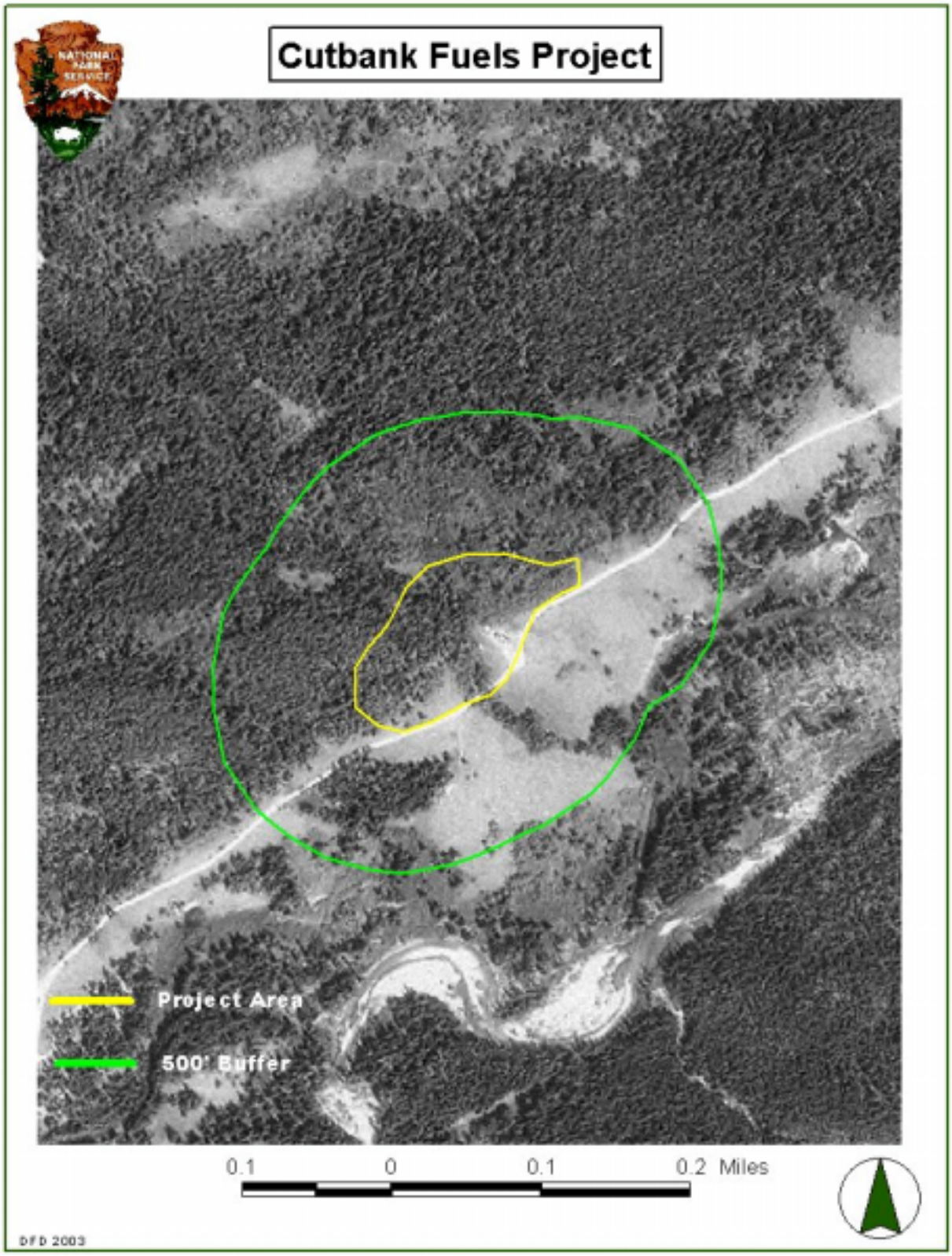
The US Fish and Wildlife Service (Service) recently proposed designating critical habitat for bull trout within Glacier National Park and elsewhere. For more information, go to the following web site: <http://pacific.fws.gov/bulltrout>.

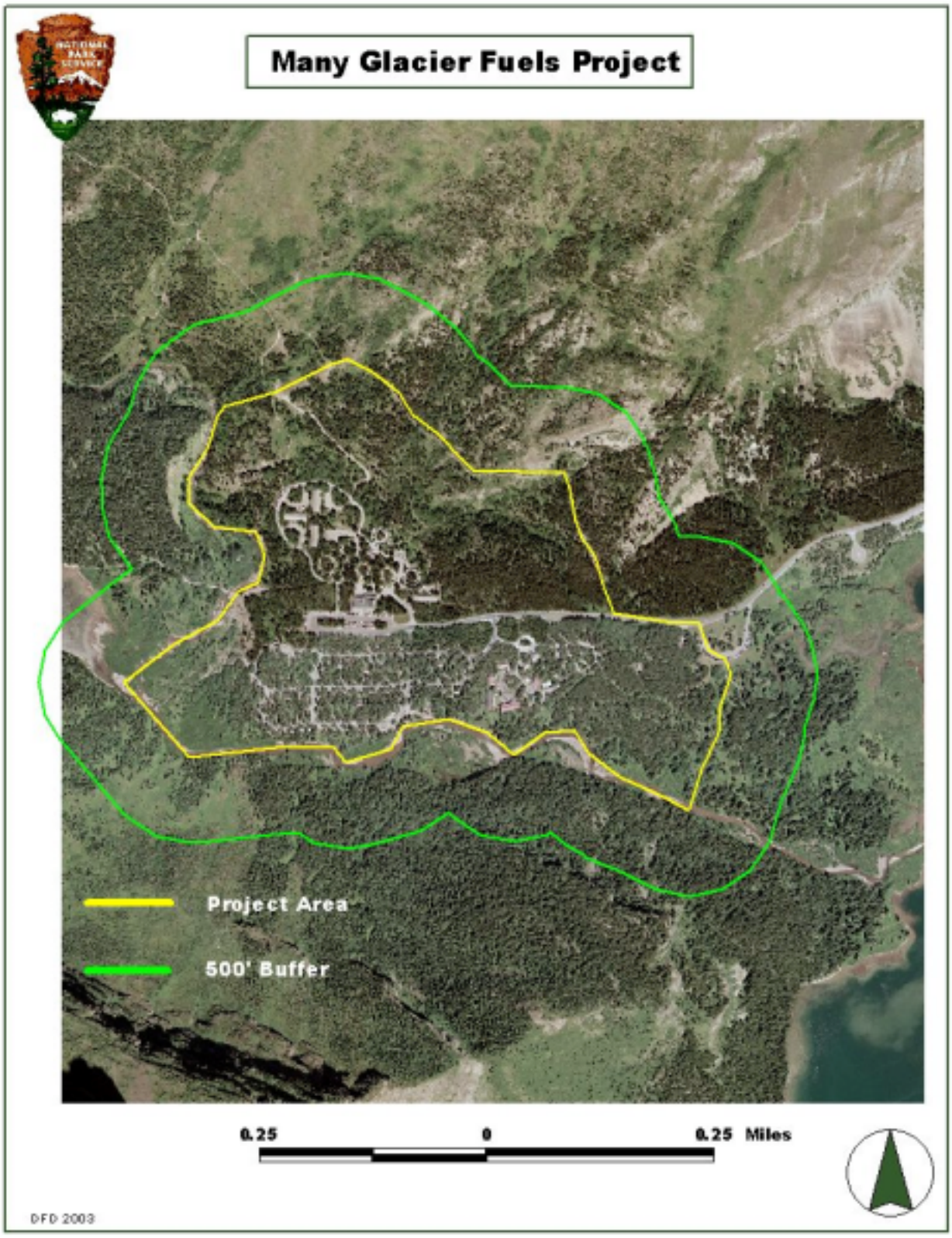
If you have additional questions regarding your responsibilities under the Act, please contact Tim Bodurtha at (406) 758-6882. Your interest and cooperation in meeting our joint responsibilities under the Endangered Species Act are appreciated.

cc: Kalispell Sub-field Office

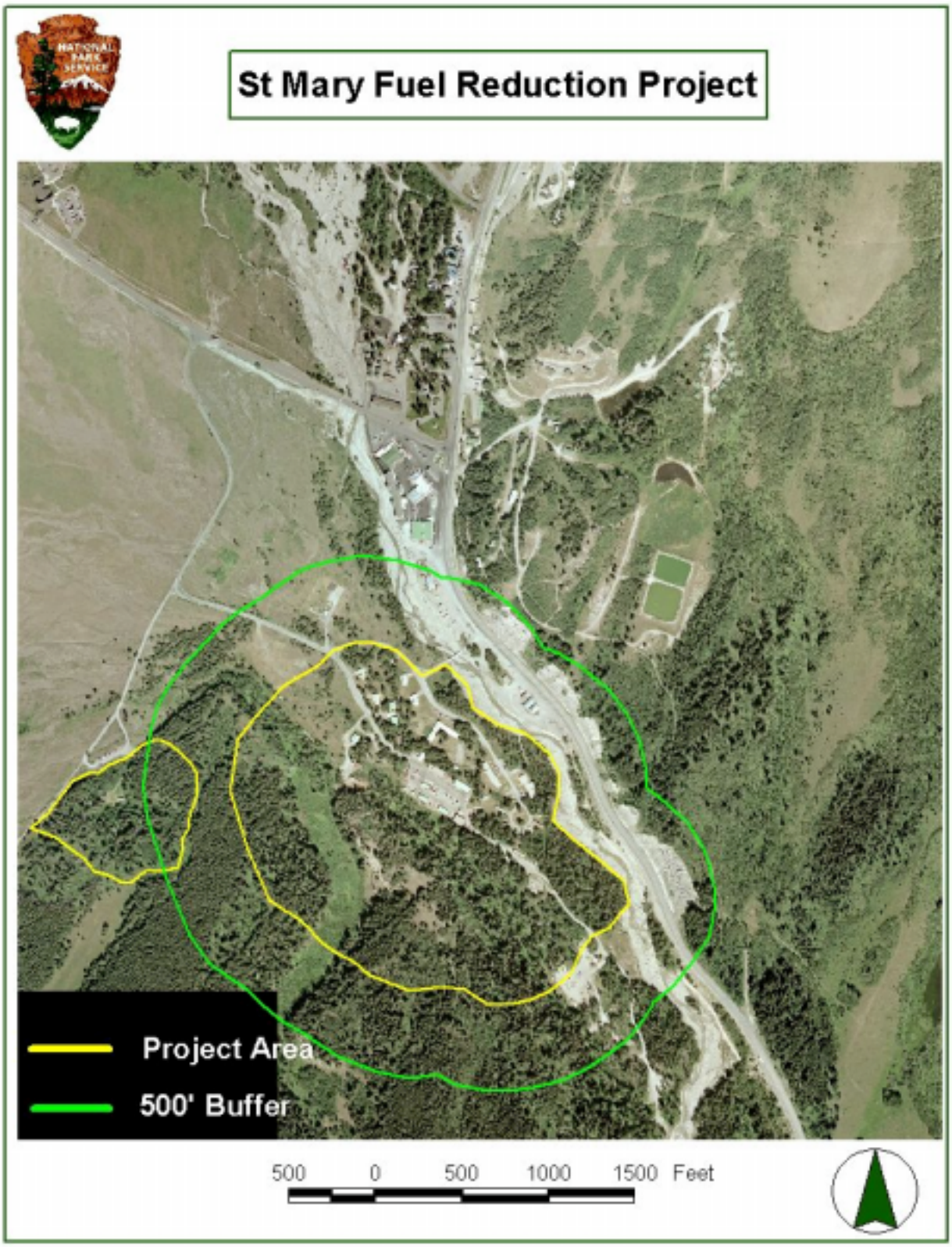
APPENDIX H: Mechanical Fuel Reduction Project Area Maps




Cutbank Fuels Project
Project Area
500' Buffer
0.1
0
0.1
0.2 Miles
DFD 2003


Many Glacier Fuels Project
Project Area
500' Buffer
0.25
0
0.25 Miles
DFD 2003


Rising Sun Fuels Project
Project Area
500' Buffer
0.25
0
0.25 Miles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Project Area
500' Buffer
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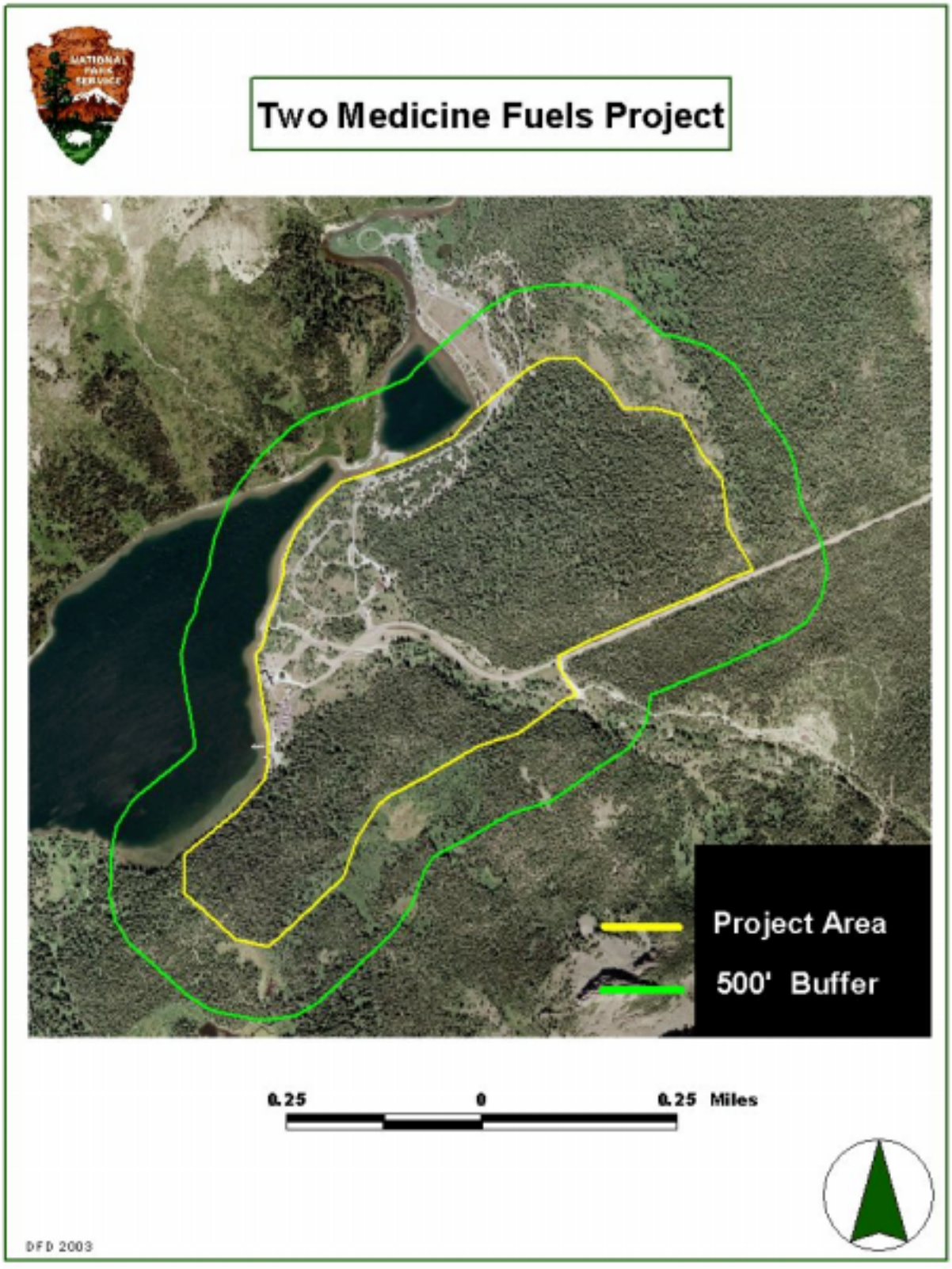
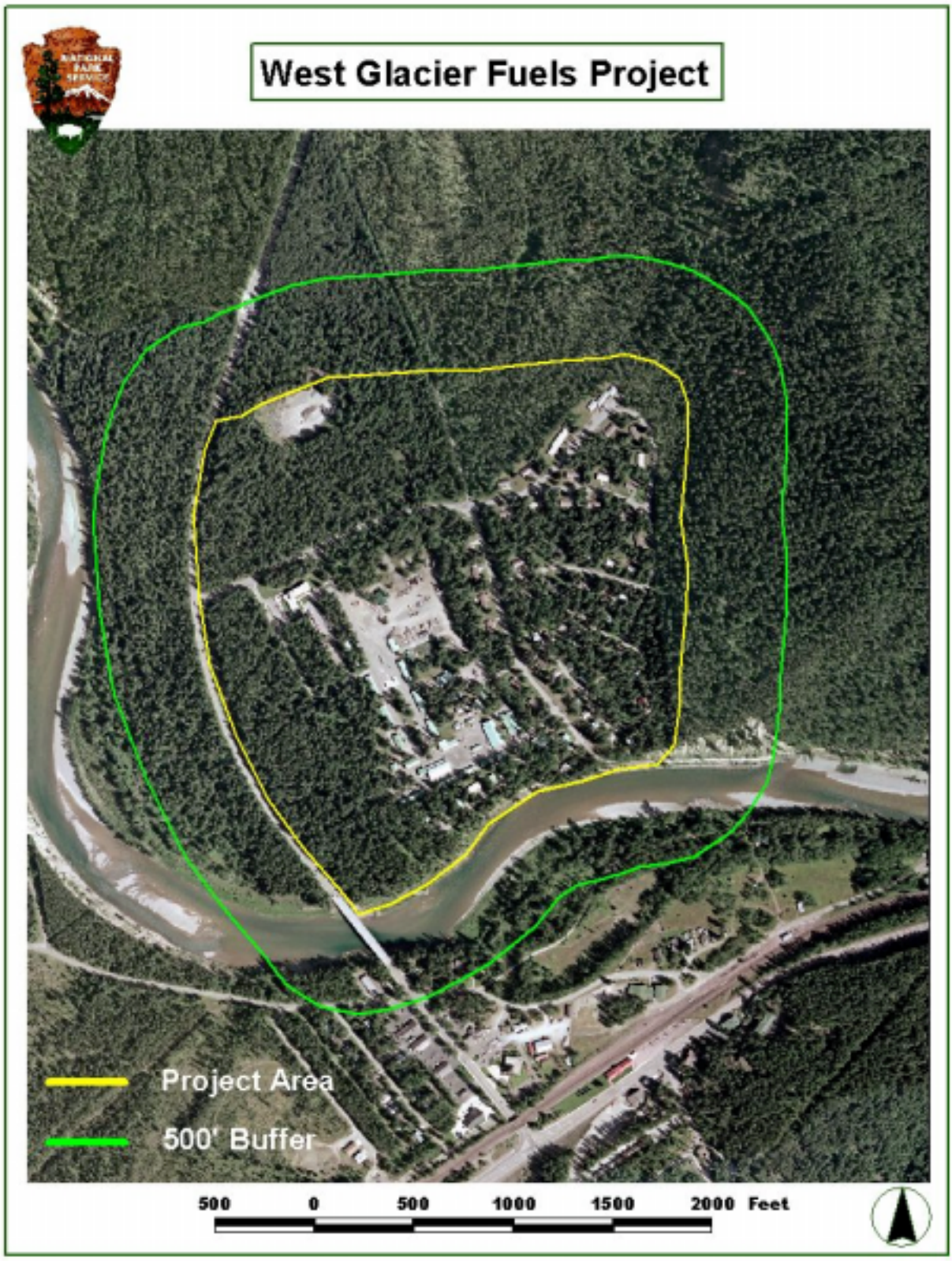

Two Medicine Fuels Project
Project Area
500' Buffer
0.25
0
0.25 Miles
DFD 2003


West Glacier Fuels Project
Project Area
500' Buffer
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