natural resources management plan
and environmental assessment

GLACIER

NATIONAL PARK / MONTANA

NATURAL RESOURCE MANAGEMENT PLAN

AND

ENVIRONMENTAL ASSESSMENT

Glacier National Park

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NATURAL RESOURCE MANAGEMENT PLAN

GLACIER NATIONAL PARK

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INTRODUCTION

Glacier National Park is one of the outstanding wilderness Parks of the World. It combines a spectacular mountain landscape, rich flora, and diverse wildlife into a remarkable natural resource complex. Glacier is distinguished by being part of a nearly contiguous group of designated Wilderness areas, along the northern Rocky Mountain crest, including the Great Bear, Bob Marshall, and Scapegoat. The Park is a unit of the International Biosphere Reserve system, established by the United Nations Educational, Scientific, and Cultural Organization (UNESCO), and it is part of the Glacier-Waterton International Peace Park. These distinctions recognize the World-wide significance of the Park and underscore the importance of a resource management program committed to preserving the Park environments, and providing use and enjoyment for Park visitors.

The Resource Management Plan arises from the Statement for Management and the Master Plan, May 1977. The Master Plan is the document which interprets National Park Service Management Policies, for application to this National Park. The Master Plan sets this goal for resource management:

> Park ecosystems will be managed to protect, preserve, or restore, where necessary, natural biotic relationships for the scenic, educational, and scientific benefit of the visitor.

This goal is reaffirmed in the Statement for Management.

The Master Plan and the Statement for Management note specific subjects for resource management activity, namely:

1. Protect and/or restore the natural vegetative, wildlife and aquatic systems.

2. Re-establish the natural role of fire to the forest.

3. Monitor impact of water collection and treatment in high elevation developed areas.

4. Reduce human impact on lakeshores and stream banks.

5. Evaluate external sources of resource damage.

6. Maintain the Canada-United States boundary zone with a means other than by the use of herbicides.

7. Rehabilitate areas which have been impacted through human recreational use.

8. Exclude domestic livestock along the eastern Park boundary.

9. Encourage natural science research to provide scientific criteria for conservation, management and/or restoration of the natural ecosystem.

10. Assert the validity of the UNESCO designation of Glacier National Park as a World Biosphere Reserve.

11. Restore and maintain air quality.

12. Use public input in management decisions.

The Resource Management Plan provides the framework for assessing, developing and implementing pertinent elements of the Master Plan and the Statement for Management.

The Management perspective will emphasize natural systems, rather than selected elements within systems. Resource management goals will be oriented to letting natural processes play their role in maintaining the integrity of natural resources, while providing for visitor use of same without undue adverse impacts and interference from human influence.

The close relationship of planned and educated resource management to scientific research is acknowledged in the Statement for Management.

Resource Management will determine specific research requirements to accomplish resource management goals in consultation with the Research Division, who will assess the feasibility of proposed research studies. They will conduct relevant research and consult with Resource Management regarding the interpretation of researchdiscoveries that relate to the development and implementation of timely and valid resource management plans.

The Resource Management Specialist is responsible for the development, implementation, and coordination of Park Resource Management Assessments, and action plans, in concert with Resource Management and Visitor Protection Division personnel.

The Resource Management Plan is a flexible document. The proposals, priorities, and funding estimates are intended as guides. It is recognized that these guides will be reviewed and adjusted periodically to meet the requirements of changing conditions.

OVERVIEW AND NEEDS

Glacier National Park was formerly perceived as a huge wilderness Park, contiguous with public lands, either classified as wilderness or left in an undeveloped state. With increasing demand and development for energy and natural resources, what was once considered a vast refuge for threatened and endangered species, is now much smaller and more fragile.

Glacier was rated the most threatened national park and natural area in the 1980 State of the Park Report to Congress. This requires a comprehensive natural resource management plan to identify,prioritize, and mitigate threats. Threats are both internally and externally generated. In addition to threats are resource disturbances, or deviations in the natural system from the natural and historical norm. These require on-going research to identify and quantify the disturbance, and to devise methods for restoration of natural processes. In addition to threats and disturbances are various monitoring and data gathering programs to establish baseline information and identification of trends.

External threats to the Park include a potential coal strip mine and drying complex within 10 miles of the Park boundary, logging up to or near the boundary on adjacent national, provincial and tribal forests, oil and gas exploration and development adjacent to the Park boundary, increased residential development with the attendent pressure to improve roads adjacent to the Park.

Internally generated threats include increased demand for concession and administration developments, increased visitation, chalet sewage disposal and spread of exotic and noxious plants. Resource management personnel are involved in the construction planning, and National Environmental Policy Act compliance processes.

Natural processes that have been disturbed by man include natural fire frequency modification by 75 years of fire suppression and its affect on forest ecology. Fish stocking has affected genetic strains of native fish populations, and altered aquatic ecology. Forest diseases and insect cycles have had their affect on forests since the arrival of the white man.

Monitoring programs are many and diverse, ranging from traditional ranger wildlife reports to the computerized bear information system dealing with the threatened grizzly bear. Any action in the Park is scrutenized for its affect on the grizzly, bald eagle, and wolf, as mandated by the Endangered Species Act. Air quality monitoring is a relatively new and growing program, stimulated by the Park, classed as a Class I area by the Clean Air Act. Air quality monitoring includes high volume total suspended particulate samplers, sulfate and fluoride sampling, telephotometer readings, daily photographs, and NADP and CANSAP and rain monitors. Water quality monitoring is done by both National Park Service and U. S. Fish and Wildlife personnel. This is also in conjunction with the Flathead River Basin Study.

The project statements detailed in this resource plan describes Glacier's attempt to mitigate past disturbance and to maintain its true wilderness for future generations to enjoy.

OVERVIEW AND NEEDS ASSESSMENT

The following consists of five-year plans to accomplish identified resource projects. (ref. project statements).

Bear Management

Project statement GLAC-N-001 identifies the nunber one priority natural resource management objective for Glacier National Park. The Park will protect and maintain natural habitat and status of grizzly and black bears, and provide for maximum security and safety to the Park visitor, while recognizing the inherent dangers of a natural wilderness, such as Glacier National Park.

Commitment to Accomplishments:

FY 1983. Monitor bear activity and populations. Incorporate and apply the "Bear Informatin Monitoring System" (BIMS) information for Visitor Protection, Resource Management and Research needs.

Funding/Staffing Required (beyond normal funding levels).

1. Extend season two weeks for 14 Bear Management Personnel, 0.5 MY, GS-4 . $ 5,562

2. Add two long-term Bear Management Specialists for continuity and expertise, 1.2 MY, GS-6 19,082

3. Adopt successful bear team concept for east side of Park, with six seasonals through Labor Day, 1.9 MY, GS-4 19,595

4. Add 30 hours helicopter flying time 8,557

5. Separate BIMS and Backcountry Permits from general communications and make it a separate operations for summer: 1.1 MY, GS-3 9,755
   0.4 MY, GS-4 3,397

6. Bear Management Support Costs:

   a. Backcountry Per Diem 2,567
   b. Truck rental 2,567
   c. Supplies and materials 5,990
   d. Backcountry brochures and Bear Management Litter Bags 5,134

   Total $82,206

Note: The above requirements represent resources beyond Park capability to accomplish the tasks outlined.

FY 1984, 1985, 1986 and 1987. Continuation of FY 1983 needs with inflation adjustment added to funding level.

Adverse Activities: Project statement GLAC-N-003 identifies present threats to Glacier National Park due to outside activities.

Severe resource degradation of the pristine North Fork area of Glacier is now occurring or about to occur, due to logging, coal, oil and gas exploration, and

development; proposed road paving adjacent to the Park, which will provide improved access to the most wild section of the Park, and increase subdivision activity adjacent to this pristine area. All this activity has necessitated increased need for manpower to monitor and evaluate adverse impacts to the water, air, vegetation and wildlife, including the threatened grizzly bear and the endangered wolf and bald eagle.

Commitment to Accomplishments. The Wilderness area of the North Fork has required minimal manpower in the past; however, the accelerated current and potential impacts from outside threats requires additional resources, in order to monitor and evaluate potential adverse impacts in a timely manner, so the Park may provide input to Assessments, and initial planning efforts that may preclude or mitigate adverse impacts on Park resources from outside activities.

Funding/Staffing Required (beyond normal funding levels)

1.	Add one long-term Park Technician for active patrolling and monitoring, 0.8 MY, GS-4	$ 10,250
2.	Add two long-term Park Technicians for patrolling, monitoring, and evaluating activities, 2 at 0.9 MY, GS-5	26,250
3.	Travel expenses	500
4.	Supplies and equipment	2,100
	Total	$39,100

NOTE: The above requirements represent resources beyond Park capability to accomplish the tasks outlined.

FY 1984, 1985, 1986 and 1987: Continuation of FY 1983 needs with inflation adjustment added to funding level.

Airshed Management. The responsibilities outlined for protection of the area's mandatory Class I status are found in project statement. Recommended actions and resources required as outlined below are considered minimum to deal with this potential problem of air resource degradation. The principal factor underlying this protection program is the need to establish quantitative baseline data through a sound monitoring effort. With this data then, management has a better capability to predict what range of effects may occur from new sources, as well as support the NPS position of mitigation and adversary proceedings.

Commitment to Accomplishments

FY 1983: Continue present monitoring and add a pollutant monitoring program.

Funding/Staffing Required (beyond normal funding levels):

1.	One Air Quality Technician, .9 MY, GS-5	$ 15,000
2.	One seasonal Air Quality Technician, .4 MY, GS-4	5,000
3.	Analysis of Pollutant Monitoring	2,500
	Total	$ 22,500

NOTE: The above requirements represent resources beyond Park capability to accomplish tasks outlined.

Visibility monitoring is funded by NPS Air Quality Office. Acid deposition is funded for one station by NPS Water Resources Lab and the second station funded for FY 1983 by special initiative funds. Any deviation from this funding should also be budgeted.

1. GLAC-N-001 BEAR Management

2. Statement of Problem. Grizzly bears are on the list of "threatened" species. Black and grizzly bear-human encounters occasionally occur, and this is a cause of much concern by the park management and the public.

Black and grizzly bears exist in Glacier National Park in nearly natural and self-sustaining populations.

Goals of the bear management program are to correlate with the mandate of Congress, as expressed in the Organic Act of 1916, which is to:

"regulate the use of ... national parks ... to conserve ... the wildlife therein and to provide for the enjoyment of the same in such manner and by such means, as will leave them unimpaired for the enjoyment of future generations."

The Park will protect and maintain natural habitat and status of grizzly and black bears, and provide for maximum security and safety to the Park visitor, while recognizing the inherent dangers of a natural wilderness, such as Glacier National Park.

Preserving the Park's bear population, while providing for minimal conditioning from human influences will be emphasized.

When bears are consistently occupying a backcountry area for food or some other reason, people are temporarily excluded. In the developed areas, a bear will be removed, if its behavior indicates habituation to an artificial environment or there is a safety hazard.

Current action includes intensive employee training, visitor education, and the close monitoring of bear sightings and behavior.

The probability of bear-human encounters are reduced through temporary area closures and relocating bears where warranted. (1982 Bear Management Plan).

There are relatively few personal injuries and property damage and bears are relatively free of human influence. However, black and grizzly bears are subjected to some human disturbances in spite of training and education efforts. Also, bear relocation successes are not high, resulting in the destruction of some animals each year.

Bear-human encounters still occur occasionally, and are potentially a source of bear habituation to humans, which may lead to more encounters.

Backcountry trails and campsites are closed temporarily, because of bear activity; however, this constitutes only about 5 percent of the total trails and campsite days available.

Bear sightings have been closely monitored and organized for ready reference.

The following documents will be transferred to the Research Office at the end of each year for permanent storage:

Originals of all bear sighting forms.

Annual computer listing of bear sightings.

A copy of all case incident reports concerning bears, including (1) bear-human confrontations, (2) bear deaths and transplants, (3) property damage caused by bears.

A copy of all written or computer-generated summaries concerning bear management.

3. Alternative Actions and Their Probable Impacts:

A. No Program. Allow free human use of all bear territory and allow free bear use of all areas within the Park. This would result in a significant increase in the number of bear-human encounters with more frequent injuries and property damage.

B. Manage bears. Allow free human use of bear territory. This would result in a significant increase in bear-human encounters with more frequent injuries and property damage. More bears would habituate to human influence and they would be subject to relocation. Undoubtedly, more bears would have to be destroyed. Ultimately, a self-sustaining population would no longer exist.

C. Manage people. Allow free bear use of all but intensively developed areas within the Park. This would result in a reduction of bear-human encounters, perhaps to negligible levels. People would be prohibited from entering designated, non-developed areas, except in winter. People would be denied the experience of traveling in territory occupied by bears, and would thus be deprived of that element of enrichment in the National Park experience.

D. No action. Continue present management actions. Manage the National Park for compatibility of use by bears and people. Designate zones for intensive human use, and maintain them in such manner as to discourage entry by bears. The remainder of the Park backcountry will be managed as a natural bear habitat, which will be compatible for limited human use.

e. Designate certain drainages for no human entry. Bears could be relocated into these areas.

4. Recommended Course of Action. Item D. above is recommended as a logical continuation of current management action.

a. Resource Management: By continuing to manage Glacier National Park for compatability of use by bears and people. The number of bear-human encounters will be minimized. This course of action results in a compatible use by both bears and humans.

b. Monitoring. The bear populations will continue to be monitored through the "Bear Information Monitoring System" (BIMS). This system is presently being revised and will be incorporated on Glacier's Data Point Computer.

c. Research.

Goals:

(1) Collect quantitative data on resident grizzly bears to provide a scientific base for management of the Park population.

(2) Make available and encourage the use of study results in both Park and Regional management programs.

Research Hypothesis

The hypothesis being tested is that fluctuations in bear food abundance and/or availability affect rate of bear incidents in the Park.

Objectives

(1) Measure the abundance and availability of "key" bear foods. Determine factors which cause the annual fluctuations in food abundance.

(2) Monitor the grizzly population size and trends with emphasis on family groups and surveys of areas of seasonal concentrations.

(3) Prepare a Park habitat map using landsat imagery. Secure data on grizzly bear food distribution for incorporation into the habitat classification.

Commitment to Accomplishments

FY 1983: Monitor bear activity and populations. Incorporate and apply BIMS information for visitor protection, resource management and research needs. Continue research projects.

FY 1984: Monitor bear activity and populations. Incorporate and apply BIMS information for visitor protection, resource management and research needs. Continue research projects.

FY 1985 Monitor bear activity and populations. Incorporate and apply BIMS information for visitor protection, resource management and research needs. Continue research projects.

FY 1986 Monitor bear activity and populations. Incorporate and apply BIMS information for visitor protection, resource management and research needs. Continue research projects.

FY 1987 Monitor bear activity and populations. Incorporate and apply BIMS information for visitor protection, resource management and research needs. Continue research projects.

1. GLAC-N-002 FIRE Management

2. Statement of Problem. Glacier National Park, in the past, was committed to a practice of total fire suppression. This practice has been recognized in the National Park Service as a problem since completion of the "Leopold Report" of 1963.

This Report pointed out that natural systems are maintained, in many cases, by occasional but powerful natural events, one of which is fire. The use of fire as a management tool is recognized by the Departmental Manual, by the National Park Service Policy, by the Statement for Management of Glacier National Park, and by Glacier's Fire Management Assessment and Fire Management Operational Plan. The Assessment was presented to the public in 1977. After considering the response by the public to this document, the Superintendent recommended changes in the current practice.

The Fire Management Plan proposes action to prescribed burning of certain critical sites, such as Ponderosa pine stands, using artificial ignition, where this is essential for approximating a sound, natural ecosystem. It also provides for allowing a prescribed, natural fire, where values at risk are minimal, and potential benefits are maximal. Any action, other than total suppression, requires a review and endorsement by a Fire Management Review Team consisting of the consensus of the Chief Park Ranger, the Resource Management Specialist, a District Ranger, and the Fire Management Officer. Suppression action, when it is taken, is conducted according to the standard practice as described in the Fire Control Systems Notebook. See Appendix A.

A sound fire management program will prevent the depletion of soil nutrients and will prevent development of a predominance of old-age forests, which are more susceptible to insects, disease, and windthrow. Forage quality, quantity, vigor, and availability are enhanced for moose, elk, deer, beaver and mountain sheep. Fuel buildup is maintained in a more natural state, decreasing the potential for a devasting conflagration fire, which is larger and more intense on some sites than it would be under a natural fire program. The Plan prevents the development of a low-contrast environment having little resemblence to the rich mosaic of cover types supporting a wide diversity of species, which is characteristic of natural systems in the Northern Rocky Mountains. Details of these and other effects are discussed in the Environmental Assessment.

3. Alternative Actions and Their Probable Impacts.

A. No program. Management action would allow all backcountry fires, natural or man-caused to burn without control measures. Allowing all fires to burn would result in an unnaturally high fire frequency and could result in environmental damage and high economic loss to property, adjacent to the Park and developed facilities within the Park.

B. Total Suppression. Total suppression of all fires leads to a disruption of natural plant succession, thus creating an unnatural ecosystem. This situation will gradually alter the type and composition of plants and animals present within an area. The increase in fuel loading associated with total fire suppression may have an abnormally severe and long-lasting effect on the watershed, and plant and animal life should a fire occur.

C. Allow Some Natural Fires to Burn. No action

Allowing some lightning fires to burn would reduce the unnatural impact of total fire suppression, and would minimize the adverse economic impact of fire damage to developed facilities or to property outside the Park.

D. Reintroduce Fire Where a Specific Need is Demonstrated. No action.

Reintroducing fire would permit restoration of a more natural environment in those areas where a free-burning natural fire would be unacceptably hazardous to Park developments or adjoining land units. In addition. it may be the only way in which some stands (Ponderosa, for example) can be maintained. The Environmental Assessment discusses these alternatives and their impacts in detail.

4. Recommended Course of Action. It is recommended that we proceed under Alternatives C. and D. In compliance with the Park's "Master Plan" and the "Statement for Management", it is recommended that fire be gradually and steadily reintroduced to the forest ecosystem. Naturally ignited fires in the higher elevations will be allowed to burn under prescribed conditions. Initially, prescribed fires will be small and experimental in nature with the intent of defining more precisely the ecological role of fire, refining prescriptions, testing the feasibility of using fire as a tool for restoring more natural forest fuels and composition, gaining experience with local fire behavior models, and building a cadre of experienced fire management personnel. All prescribed fires will be done in compliance with the Montana Airshed Group Smoke Management Plan.

Normal presuppression activity and preparation will be supported as it has been in the past with the use of funds allocated to the park for this purpose. This activity will include the maintenance of a fire detection system and standing initial attack forces. Initial attack forces will need to have a higher level of training with emphasis on fuel assessment and fire behavior observations, becausemany critical management decisions will be based on the reports of the field crew on the fire site. This training will also be funded with Park operating accounts. Field activity on going management fires will be paid with operating funds and will include all monitoring activity and control action on prescribed fires artifically ignited. Should a management fire escape prescription or move out of recognized and planned fire zones, the usual suppression action to return the fire to prescription or put it out completely will be funded with the emergency suppression accounts established for this purpose. Aerial monitoring of management fires will be conducted, where possible, in conjunction with other fire activity or detection operations to minimize the impact of this activity or operating budgets. (Some types of projects will not be possible, under existing budget constraints. In these cases, the projects will have to be deferred until funding becomes available).

a. Resource Managment. Under Alternatives c. and d., the forest ecosystem will gradually return and remain in a "natural condition" by allowing fire to play its natural ecological role.

b. Monitoring. Natural fire danger rating indexes and associated fire-related data will continue to be monitored. All prescribed fire will be monitored for effect.

c. Research. Scientific research will address the following subjects:

Impacts of mountain pine beetle epidemic on fire management

Fire History of Glacier's Forests

Basic vegetative resource inventories, includes habitat typing

Succession after natural prescribed fire

Effects of prescribed natural fire on wildlife; especially those associated with alpine areas

Commitment to Accomplishments:

FY 1983 - Compile and submit all data necessary to complete the Park's commitment to "FIREPRO" (Normal Fire Year Programming) continue to plan and monitor for prescribed burn project in Fall (FY83). Conduct fire management programs, plans and actions according to guidelines in Glacier's Fire Management Plan.

FY 1984 - Prepare an updated Fire Management Plan. Monitor and study effects of FY83 prescribed fire. Conduct fire management programs, plans and actions according to guidelines in Glacier's Fire Management Plan.

FY 1985 - Continue to conduct fire management programs, plans and actions, according to guidelines in Glacier's Fire Management Plan.

FY 1986 - Continue to conduct fire management programs, plans and actions, according to guidelines in Glacier's Fire Management Plan.

FY 1987 - Continue to conduct fire management programs, plans and actions, according to guidelines in Glacier's Fire Management Plan.

1. GLAC-N-003 ADVERSE Activities (Threats)

A. Sage (Cabin) Creek Coal Mining Proposal, B.C., Canada

2. Statement of Problem: The Sage (Cabin) Creek Coal Mine near Glacier's northern boundary may have an influence on a number of Glacier's natural resources, (i.e. air and water quality, grizzly habitat and movement, etc.). The Park became aware of coal exploration activity 8 miles north of the Canadian border during the summer of 1974. The proposed developer, Sage Creek Coal Company, a subsidiary of Rio-Algom Mines, Ltd., planned to mine 132,000,000 tons of Cabin Creek coal over a 20/30 year period. Estimated sulfur leaching from coal would be 600,000 tons. Latest information indicates that annual production plans have been reduced to 1,500,000 tons per year.

Concerned parties include members of the Montana Congressional Delegation, Montana residents, especially those who live in the Flathead River Basin, environmental organizations, Park visitors, and Canadian citizens and groups.

The North Fork area in Glacier National Park, which lies just south of and downstream from the proposed coal mining area in B.C., Canada, is prime wilderness. There are approximately 425 square miles of uninhabited wild country north of Glacier National Park in British Columbia, Canada.

Wildlife from Glacier National Park, interact with wildlife across the border, and often migrate from one side to the other. Montana residents of the Flathead River Basin are particularly concerned about pollution of the Flathead River and Lake from mining operations.

The center of the North Fork River forms the west boundary of Glacier National Park, and has been designated a National Scenic River from the Canadian boundary to Camas Creek and a Recreational River below Camas Creek. There is concern about the prime fishery associated with the river, should water quality be affected by mining operations. This issue is particularly difficult and sensitive, because of its International aspects.

Glacier's concerns for adverse environmental impact have been made known to the Canadian Government and the Rio-Algom Company through the U. S. State Department and the International Boundary Commission.

These concerns have been included as a part of feasibility studies by the Company and have influenced some of the Company's ultimate plans for townsites, production, etc.

During 1978, the E.P.A. Flathead Environmental Impact Study Committee received $400,000 to implement a plan and fund some of the needed research. Adequate water quality data should be available when past and present research is compiled and planned research to cover any voids is accomplished. Later phases of the plan will address wildlife and fishery data. Glacier's Assistant Superintendent is Vice-Chairman of this Committee.

The Park has requested personnel and funding to initiate research that will provide quantitative basic resource data for the North Fork area. This data is necessary, in order to detect early adverse impacts from mining, and also to provide information that might influence feasibility studies or mitigate impacts should mining of the coal proceed.

Present research and studies in the Park's North Fork include bears and air quality.

The U. S. Fish and Wildlife Service is conducting aquatic studies on tributaries of the North Fork. Their 1977 report has been received by the Park, and contains much aquatic data valuable to the Park's Resource Managers.

The Park's action may have been a factor in the Company's decision to reduce their production schedule.

This one change reduces impacts considerably in that a railroad will not be required and habitation of this wilderness area will be greatly reduced.

The proposed townsite has been moved further from the United States border.

Early detection of adverse impact from any mining activity will be possible, only if the Park has good baseline data.

Due to the recent drop in coal prices, this project has been put on hold by the Sage Creek Coal Company.

3. Alternative Actions and Their Probable Impacts:

A. No Program. Refrain from getting involved in activities that are occurring outside Glacier National Park boundaries. The impact of this Alternative relates to the fact that many activities outside and adjacent to the Park affect Park resources.

B. No Action. Continue to monitor progress of the proposed Cabin Creek Coal development in an effort to provide information to those involved. This might result in measures that may preclude development or mitigate impacts.

C. Obtain basic natural resource data that will place Park management in a better position to predict actual environmental impacts on resources from mining and resource degradation should development proceed.

4. Recommended Course of Action. The recommended course of action is Alternative B. and C. We must continue to monitor the progress of the Cabin Creek project and provide information that may mitigate impacts. Base line data is essential in order to document environmental impacts and predict impacts that may occur, due to this or any other project. Park management will take an active role in promoting Park protection ideals with lead United States agencies.

a. Resource Management. Provide baseline data to reduce environmental impacts caused by development of the coal mine.

b. Monitoring. Monitor all sources of information relating to the development of Cabin Creek.

c. Research. Continue collecting baseline data on North Fork area. This data is essential to monitor environmental impacts.

Commitment to Accomplishments:

FY 1983. Continue to monitor Cabin Creek Project. Continue to collect baseline data.

FY 1984. Continue to monitor Cabin Creek Project. Continue to collect baseline data.

FY 1985. Continue to monitor Cabin Creek Project. Continue to collect baseline data.

FY 1986. Continue to monitor Cabin Creek Project. Continue to collect baseline data.

FY 1987. Continue to monitor Cabin Creek Project. Continue to collect baseline data.

1. GLAC-N-003 ADVERSE Activities (Threats)

B. Logging Near Boundary

2. Statement of Problem: Logging along Glacier's boundary not only causes a negative visual impact, but also affects animal movement patterns by opening the forest and attendant road building. Logging has been on-going in the Sage Creek and tributaries of the North Fork drainage for years, but only since 1977 has there been active plans to log the Kishenena drainage (same stream as Kishinena in Canada and Kishenehn in the United States). The declared reason for the logging is to harvest pine beetle-damaged timber before it becomes useless for lumber (3 - 5 years).

In addition, there is much larch, douglas fir, sub-alpine fir, spruce, and lodgepole pine in this drainage. A logging road has been constructed to the eastern terminus at Kishinena Creek, about one mile north of the International boundary. At one point the road comes within 100 yards of the boundary.

In 1978, a decision was made to "salvage logs" on 39,000 acres in the area, and to hold 17,000 acres along both Waterton and Glacier's boundaries for study. Some cutting was done to Glacier's boundary in the Kishenehn Creek area. Parts of the previously designated Flathead Provincial Forest Reserve lie in both the area to be salvage-logged and the study area. The position of both Waterton Lakes National Park and Glacier National Park is that the entire reserve should be a Provincial park, which would in effect enhance the integrity and expand the size of the Waterton/Glacier International Peace Park.

This is an extremely sensitive issue, not only because of International implications, but because of an apparent conflict among various Canadian Federal and Provincial agencies.

Glacier National Park expressed its concern relating to wildlife and human encroachment resulting from logging proposals to the Canadian Embassy via the Regional and Washington Directorates. Citizens' groups in Canada are concerned and Parks Canada has declared its disapproval of the proposed logging.

Parks Canada officials have appealed to Glacier National Park officials to support them in their efforts to protect the 1956 Provincial Reserve adjacent to the Glacier/Waterton International Peace Park from logging and other development interests.

Park Rangers are patrolling and improving posting on the boundary on an intermittent basis and reporting latest developments relating to logging activities.

The Environmental Protection Agency sponsored-studies in the North Fork area should result in timely data that will provide for early detection of environmental impacts from logging, and other proposed development.

Blackfeet Reservation logging has been pursued on Hudson Bay Divide on the Blackfeet Reservation for the past 10 years. Clear-cutting has actually occurred up to the Park boundary on Divide Creek. Other clear-cuts are quite extensive and adjacent to U. S. Highway 89, although not visible from the St. Mary, Going-to-the-Sun Corridor.

Forest thinning by Bureau of Indian Affairs crews has occurred to within 100 yards of the Park boundary behind East Glacier on the Autumn Creek Trail.

The north slope of Boulder Ridge, near the Many Glacier Road, is a potential logging area. This would open a new area to logging, with cut areas visible to visitors, driving into the Many Glacier area. Wildlife, such as elk and grizzly bear, would be affected by opening the forest, and by the attendant road building.

3. Alternative Actions and Their Probable Impacts:

A. No Program. Refrain from getting involved in activities that are occurring outside Glacier National Park boundaries. Potential impacts include water quality degradation, negative visual impacts, and wildlife habitat disturbance.

B. No Action. Continue to monitor logging operations along the Canada/U.S. Boundary.

C. Obtain basic natural resource data that will place Park management in a better position to predict actual environmental impacts on resources from logging operations.

Logging on the Blackfeet Reservation. Park management should coordinate with BIA and Tribal officials and consult in forest planning to help mitigate visual and wildlife impacts resulting therefrom.

4. Recommended Course of Action: The recommended course of action is Alternatives B and C. We must continue to monitor logging operations and provide data that may mitigate impacts. Baseline data is essential in order to document environmental impacts and predict impacts that may occur due to logging.

a. Resource Management: Provide baseline data to reduce environmental impacts caused by logging operations.

b. Monitoring: Continue to monitor all logging operations near the Park boundary.

c. Research: Continue collecting baseline data on North Fork area. This data is essential to quantify environmental degradation.

Commitment to Accomplishments:

FY 1983. Continue to monitor logging operations. Continue to collect baseline data.

FY 1984. Continue to monitor logging operations. Continue to collect baseline data.

FY 1985. Continue to monitor logging operations. Continue to collect baseline data.

FY 1986. Continue to monitor logging operations. Continue to collect baseline data.

FY 1987. Continue to monitor logging operations. Continue to collect baseline data.

1. GLAC-N-003 ADVERSE Activities (Threats)

C. Oil and Gas Leasing and Exploration

2. Statement of Problem. Oil and gas leasing and exploration along Glacier's boundaries may have a direct influence on Glacier's wildlife, air and water quality, and visual resources.

Oil and gas leasing activity is occurring adjacent to all boundaries of the Park, except the border, between Glacier and Waterton Lakes National Park in Canada.

Wells have been drilled and some are producing on the Blackfeet Reservation, which borders the Park to the east. Some of these were drilled during the 50's, and several were drilled from 1978 to 1982. Several wells near East Glacier are producing and there are plans to drill 8 or 9 more in that area.

A proposed drill site is less than one mile from the east boundary on Cut Bank Creek Ridge.

The entire region around the Park is considered to be a "hot" area for oil and gas leasing, especially since the recent Rocky Mountain east front gas discoveries in Wyoming. For example, the Flathead National Forest, adjacent to the Park, has over 900,000 acres under lease. The Lewis and Clark National Forest also has extensive leases.

Ninety-four leases are located in the Great Bear and Bob Marshall Wilderness areas adjacent to the park. (240,000 acres on the Flathead National Forest and 180,000 acres on the Lewis and Clark National Forest).

The effects of exploration activity on the Regional wildlife that migrate between Glacier National Park and the U. S. Forest Service lands is but one of the issues that is of concern to Park management that will be addressed. Other issues include air and water quality and visual impacts.

The most serious adverse impacts, of course, would occur if actual drilling activity occurred and oil or gas were discovered. Oil and gas leasing activity is being monitored by Park management.

The Park provided input into the initial BLM/USFS Environmental Impact Statement relating to the granting of oil and gas leases on U. S. Forest Service lands, adjacent to Glacier National Park. The Park has submitted funding requests for wildlife, human impact, water and air quality studies, as well as basic research that would provide quantitative data that could be used to prevent or mitigate adverse impacts from proposed oil and gas exploration and development. This information is also applicable to other outside influences noted in this plan.

Members of the Park staff attend public meetings and hearings on the oil and gas issue. The staff also meets several times a year with the Blackfeet Tribe, in order to mitigate adverse impacts from their oil and gas exploration activities. Close monitoring provides the park with lead time in acquiring information that might be used to prevent or mitigate adverse impacts.

Even though the Blackfeet Tribe has drilled wells near the boundary, without benefit of environmental analysis, they have done a satisfactory cleanup and rehabilitation of the sites near the Park, and have consulted with Park officials during drilling operations.

Because of claimed treaty rights in and adjacent to the Park, relations with the Blackfeet are sometimes sensitive; however, cordial meetings with them have resulted in mitigation of some potential impacts and have maintained satisfactory communications and atmosphere.

3. Alternative Actions and Their Probable Impacts.

A. No Program. Refrain from getting involved in activities that are occurring outside Glacier National Park boundaries. The impact of this Alternative relates to the fact that many activities outside and adjacent to the Park affect Park resources.

B. No Action. Work with agencies along the Park boundary to minimize adverse impacts if exploration and development occur on their property. Continue to work with U.S. Forest Service, BIA and Blackfeet Tribe to encourage environmentally sound practices in exploration and development of oil and gas.

4. Recommended Course of Action. The recommended course of action is Alternative B. Oil and gas exploration will continue along the Park boundary, through cooperation we will encourage the use of environmentally sound practices.

a. Resource Management. Provide data to reduce environmental impacts caused by oil and gas development and exploration.

b. Monitor. Monitor all oil and gas exploration, leasing, and development.

c. Research. Collect data as it pertains to oil and gas exploration and development and what effects it may have on the park's ecosystem.

Commitment to Accomplishments

FY 1983. Continue to monitor oil and gas activities near the Park boundary and obtain baseline data as to probable effects caused by these activities.

FY 1984. Continue to monitor oil and gas activities near the Park boundary and obtain baseline data as to probable effects caused by these activities.

FY 1985. Continue to monitor oil and gas activities near the Park boundary and obtain baseline data as to probable effects caused by these activities.

FY 1986. Continue to monitor oil and gas activities near the Park boundary and obtain baseline data as to probable effects caused by these activities.

FY 1987. Continue to monitor oil and gas activities near the Park boundary and obtain baseline data as to probable effects caused by these activities.

1. GLAC-N-004 BACKCOUNTRY Management

2. Statement of Problem. Backcountry management is necessary to reduce bear-human conflicts, as well as maintain natural habitat and the wilderness quality of the backcountry. The need to intensify efforts to manage the backcountry of the Park was recognized in 1969. Specific efforts were made to survey the area to record and document resource damage. As a result of the field work done in 1969, and 1970, measures were instituted in 1981 to limit the overnight use of the backcountry by people and horses, limit the use of open fires, and initiate a cleanup campaign to rid the backcountry of tons of accumulated junk. In addition to cleaning up the area in general, the defined mission was to preserve a quality experience for backcountry users and reverse resource degradation. The survey recognized four ecosystem types, west slope forest, alpine, east slope bunchgrass, and aquatic, for their unique resource considerations.

A Backcountry Management Plan was first approved in 1973, and revised in 1975, when it was circulated for public review. This Plan, which was directed at managing visitors in the backcountry, has undergone annual revision to keep it current. In 1975, a companion document "Backcountry and Wilderness Maintenance Standards" was prepared to compliment the efforts to manage people and bring maintenance activities into concert with the Wilderness Management Policy. Both of these plans have been developed to coincide with other plans, e.g., Bear Management, etc.

Overnight use of the backcountry is controlled through the issuance of mandatory Backcountry Use Permits, which are coordinated through the Communications Control Center, where limits of people and horses using a system of designated campgrounds is controlled. The use of open fire is also regulated as a condition of the permit. Closures of use areas for bear activity or fire control measures are also instituted through the permit system.

Periodic evaluations of backcountry campgrounds have been conducted to provide a systematic approach to "identifying problems of overuse, poor site locations, wildlife conflicts, and related impacts. Through this relatively simple monitoring system, several of the more obvious problems have been identified and corrected. Some have been identified which will require a long-term solution.

A task force approach to cleaning up 50 years accumulation of trash has been quite effective with the removal of old dumps, fire lookouts, telephone lines and fences. A continued maintenance program, plus the continued use of the pack-in, pack-out procedures by all backcountry users, should be effective in preserving the pristine qualities of the backcountry.

3. Alternative Actions and Their Probable Impacts

A. No Program. Abandon the mandatory permit system. This management scheme places heavy emphasis on educating and informing the user regarding all the elements of over-use and low impact use of the environment and places all the responsibility for compliance and environmental consequences on the users.

Experience has shown in such an area of high national interest and popularity, that the Park would be inundated with backcountry users during July and August. The quality of experience from sheer numbers of people would be compromised and the resource unacceptably impacted. These impacts include habitat degradation, visual intrusions and potentially higher bear-human conflicts.

B. No Action. Control overnight use of the backcountry through the issuance of Backcountry Use Permits, where limits of people and horses using a system of designated campgrounds is controlled. Allow for a system of zones in specific locations where users would have more freedom to select campsites under a strict code of conditions.

The above alternative is the one presently used by Glacier National Park. This system has met with very good success and its continued use is anticipated.

C. Retain the permit system scheme of visitor control but modify it to a Park-wide system of use zones, where users would have more freedom to select campsites under a strict code of conditions to protect the resource.

Due to the terrain, and vegetation in most of Glacier National Park, users are rather confined to well-defined travel routes along the maintained trails. Existing backcountry campgrounds have evolved from a historic use pattern along the trail system. It is judged that users could continue to camp and confine their impact to these historic campsites, because they exist in the few desirable sites, where there is level ground, water, freedome from insects, and convenient travel distances.

In only one location, Nyack-Coal Creek Wilderness Camping Zone, has the zone concept proved to be workable.

4. Recommended Course of Action. The recommended course of action is Alternative No. B. Combined efforts of research and management analysis are gradually perfecting techniques and improving methods of visitor management and mitigating resource impacts. Efforts will continue to relieve the frustrations of the mandatory permit system. Resource degradation has been reversed and, with improved standards for monitoring impacts and some rehabilitation of impacted areas, a compatible balance of overnight use can be attained. Increased effort will also have to be applied in measuring and possibly adjusting day-use in some areas.

a. Resource Management. As methods are improved to reduce bear-human conflicts, visual impacts, and habitat alteration, these methods will be applied to backcountry management.

b. Monitoring. Continued monitoring of backcountry resource impacts will indicate if management actions are required to mitigate the impacts.

c. Research. Combined efforts of Research and Management analysis are gradually perfecting techniques and improving methods of people management and mitigating resource impacts.

Commitment to Accomplishments:

FY 1983. Continue to manage backcountry to minimize human-bear conflicts, visual impacts and habitat alteration.
FY 1984 " " " " " " " " "
FY 1985 " " " " " " " " "
FY 1986 " " " " " " " " "
FY 1987 " " " " " " " " "

1. GLAC-N-005 DOMESTIC Livestock Trespass Management

2. Statement of Problem. Domestic livestock trespass into the Park potentially could reduce wildlife range, introduce exotic plant species, cause erosion, and promote degradation of the water quality.

The boundary between Glacier National Park and the Blackfeet Reservation is 103 km (64 miles) in length. There is approximately 13 km (8 miles) of fencing on this boundary. Cattle and horses from the Reservation have ventured over five miles inside the Park and have been observed in backcountry areas,such as Poia Lake and Trick Falls in the Two Medicine Valley. Over seven hundred head of cattle have been observed from a helicopter at one time, in areas up to three miles inside the Park. Law enforcement and cooperative efforts have improved the situation in recent years. Such activity is not compatible with Glacier's designation as an International Biosphere Reserve. Other adverse impacts of livestock trespass include the following:

a. Native vegetation in the prime bunch grass wildlife range is being replaced by exotic species as a result of livestock trespass.

b. Domestic livestock can transmit disease to wildlife. In the past, this has occurred between domestic sheep and Rocky Mountain Bighorn sheep in the Many Glacier Valley.

c. Unnatural erosion is occurring as a result of domestic livestock trails.

d. Park road shoulders and banks are being damage by trespass, due to erosion and accelerated spread of exotic plants.

e. Pollution is occurring in both domestic and natural water supplies.

f. Domestic livestock pose a safety hazard along Park roads. The narrow roads and blind curves increase the risk of collisions, betwen vehicles and livestock. Collisions have occurred with trespass livestock.

Cattle and horses have been impounded, fines and impoundment fees have been collected from owners and citations continue to be issued. The Park sends registered warning letters to owners and permittees, notifying them to remove trespass livestock and advising them of the consequences of failure to comply with the warning. Citations are issued if compliance is not obtained.

There have been numerous meetings with the Blackfeet Tribal Council during the past several years in an attempt to resolve the trespass problem. Proposals to construct a fence along the boundary have been rejected by the Tribal Council to-date.

3. Alternative Impacts and Their Probable Impacts.

A. No Program. This is an undesirable alternative, as inaction would not reduce the impact on the ecosystem and would most likely result in additional damage. This alternative would have an adverse impact on proposed wilderness areas, and may be construed legally, as permission for grazing in the Park. The risk of introducing diseases to wildlife populations also would exist under this alternative.

B. No Action. Continue Ranger patrols at present level. Present action has not alleviated an already serious situation.

The inability to stop the trespass of domestic livestock under the present action is only allowing a somewhat slower deterioration of the ecosystem than would result from no action at all.

C. Increased Law Enforcement. The trespass problem may be reduced by a more aggressive law enforcement program. Such a program would include continued issuance of citations, building of impoundment areas, and sale of unclaimed or forfeited livestock to recover impoundment and other legal fees. Even those legal actions would probably not solve the problem entirely, would certainly tend to alienate the BlackfeetTribe and could escalate into a serious confrontation. This increase in law enforcement activities, to be effective, would require a large, permanent increase in staff. Due to the likelihood of hostile encounters which would result from increase law enforcement, this alternative becomes less desirable than the continuance of present management action.

D. Implement a fencing program. A program of fencing and installation of more effective cattle guards in areas of continued trespass is the most viable alternative. While this solution may not be esthetically pleasing in a natural area, it appears to be the most effective means of solving the trespass problem. If installed and maintained properly, the fence should reduce illegal trespass of domestic livestock to a minor nuisance. In August 1978, the Blackfeet Tribe threatened an injunction against the Park, if a fencing program were begun. However, fencing remains an alternative for the future, if the Blackfeet treaty issue is resolved. In the meantime, the existing 8 miles of fence should be maintained to provide at least minimal protection for Park resources.

E. Work with Blackfeet Reservation Tribal Council and individual landowners or persons grazing near border in an effort to eliminate any trespass problems before they occur.

4. Recommended Course of Action: The preferred recommendation is alternatives B and E. Park Rangers will continue to patrol the boundary and issue citations for illegal domestic livestock trespass when necessary. The Park will also be involved in an active program with the Reservation to alleviate problems before they occur. This alternative will include working with the Tribal Council, adjacent landowners, and livestock grazers.

a. Resource Management. Rangers will continue to note any trespass violations and resource degradation due to trespass. They will work with the various owners and Tribal Council to eliminate further trespass. Work with Tribal wildlife managers to enhance wildlife habitat of mutual interest adjacent to the boundary.

b. Monitoring. Park Rangers will continue to monitor the trespass livestock and document number, location, and identity.

c. Research. No Active Program.

Commitment to Accomplishments

FY 1983. Until Treaty resolution it will be necessary to continue extensive patrolling to reduce domestic livestock trespass. Upon Treaty resolution, the fencing program will begin.

FY 1984. Until Treaty resolution it will be necessary to continue extensive patrolling to reduce domestic livestock trespass. Upon Treaty resolution, the fencing program will begin.

FY 1985. Until Treaty resolution it will be necessary to continue extensive patrolling to reduce domestic livestock trespass. Upon Treaty resolution, the fencing program will begin.

FY 1986. Until Treaty resolution, it will be necessary to continue extensive patrolling to reduce domestic livestock trespass. Upon Treaty resolution, the fencing program will begin.

FY 1987. Until Treaty resolution, it will be necessary to continue extensive patrolling to reduce domestic livestock trespass. Upon Treaty resolution, the fencing program will begin.

1. GLAC-N-006 HAZARD TREE Management

2. Statement of Problem. Hazard trees in developed areas may result in personal injury or extensive property damage. Most of Glacier National Park is managed for the perpetuation of natural processes. This approach to resource management extends to areas developed with facilities, such as campgrounds, housing, structures, parking, trails, etc. Within these developed areas, there are standing trees which are ecological components of the surrounding natural area. Dead and dying trees are an integral part of natural ecosystems, but cause hazards to life and property in developed areas. Conditions that cause tree mortality and failure are accelerated in developed areas, because developments inadvertently damage root systems and tree structures, introduce pathogens, and expose trees to stress by opening stands to wind and other environmental factors.

A documented hazardous tree survey and treatment program was initiated in 1978. Most developed areas were surveyed and tree hazards were located, described and evaluated. Annual hazardous tree surveys will be undertaken in all developed areas, but it will be several years until all moderate and high hazards can be eliminated or developments relocated, at current funding and staffing levels.

Hazardous tree evaluation criteria attempt to identify degree of danger to life and/or property and to judge imminence of tree failure. Surveyors also judge ecological importance of hazardous trees and they recommend mode of treatment including relocating developed facilities. Treatment, namely felling high priority hazardous trees, is undertaken mostly by the special fire suppression team located in each district. Selected trees are felled locally by Subdistrict people, but not necessarily within the formalized hazardous tree program.

Each year some trees fail, most of which had not been identified in formal surveys. Failures often were the result of root decay and could not be identified from external indicators.

3. Alternative Actions and Their Probable Impacts.

a. No Program. Eliminate the system of documenting surveys and treatments. Allowing the natural process of trees "falling where they may" in developed areas may result in damage or personal injury. Thus, resulting in tort claims against the Park and economic losses.

b. Reduce tree hazards as they become evident and as time and funding allow. Activity at this level would inconsistently resolve hazardous conditions, possibly resulting in undetected hazards which could cause damage and personal injury. The Park would be liable for tort claims. Trees of ecological value might not be evaluated fairly, resulting in unacceptable loss of ecologically important individuals.

c. Survey all developed areas. Treat high priority hazards. Activity at this level would apply consistency to the detection and evaluation of hazardous trees. Hazardous conditions would decrease steadily. Trees of ecological value may be evaluated fairly, preventing their loss by inattention to standards or by oversight.

4. Recommended Course of Action. The recommended course of action is alternative c. Continue annual surveys of developed areas. Eliminate high risk hazards as soon as possible after surveys by felling hazardous trees, which have low ecological value or by closing or relocating target developments under trees with high ecological value.

a. Resource Management: Eliminate those trees identified as hazardous in developed areas.

b. Monitoring: Continue to survey for hazardous trees.

c. Research. None anticipated.

Commitment to Accomplishments.

FY 1983. Continue to survey and remove those trees posing a hazard in developed areas.

FY 1984. Continue to survey and remove those trees posing a hazard in developed areas.

FY 1985. Continue to survey and remove those trees posing a hazard in developed areas.

FY 1986. Continue to survey and remove those trees posing a hazard in developed areas.

FY 1987. Continue to survey and remove those trees posing a hazard in developed areas.

1. GLAC-N-007 VEGETATION MANAGEMENT

A. Rehabilitation of Disturbed Sites

2. Statement of Problem. In past years some rehabilitation work has been undertaken without adequate consideration of the consequences of the work. For example, the sowing of seeds of exotic plant species, such as clover along the Park roadsides, while aesthetically pleasing, has created an attractive nuisance for black bears. As a consequence, interaction between bears and humans is increasing, normal fear is decreasing and the risk of confrontations has escalated. The denuding of alpine meadows during and after construction of the Logan Pass Visitor Center is an example of ecosystem alteration without appropriate plans for site rehabilitation.

The National Park Service operates under Congressional mandate to protect Park resources for future generations, while providing for use by present generations. This dochotomy inevitably leads to some alteration of Park resources.

Whenever man alters a natural system within the Park, rehabilitation of the system, either by natural processes or by appropriate management action, is a desirable goal. Areas which have been disturbed by man are prime sites for additional alteration, such as soil erosion and invasion by exotic plant species.

A rehabilitation plan is now part of all Park construction projects. Rehabilitation costs should be part of the construction package.

The Park's "Fire Management Plan" includes a section on rehabilitation of disturbed sites, which result from fire suppression activities, such as fire line construction.

Native plants will be used for rehabilitation projects in the Park. Projects are limited to methods which have been previously tested, or which are supported by scientific research. Two greenhouses, one for each side of the Park, provide a source of plants to use in revegetation projects.

Work has been initiated on restoring disturbed sites in the heavily visited Logan Pass area. A project to identify campsites in need of rehabilitation was initiated in 1978, and is continuing.

Recognition of past errors in rehabilitation efforts has increased awareness of the need for ecologically sound approaches to future projects. Current rehabilitation projects employ methods which have been proven sound and effective in prior use, or which have been developed and verified through sound scientific research.

The need for rehabilitation following construction projects is recognized, and suitable plans for such work are included as part of the project. Current rehabilitation projects employ methods which have been proven sound and effective in prior use, or which have been developed and verified through sound scientific research.

The need for rehabilitation following construction projects is recognized, and suitable plans for such work are included as part of the project. Maintenance staff should consult with Resource Management personnel prior to any major projects.

3. Alternative Actions And Their Probable Impacts

a. No Program. Allow rehabilitation of disturbed sites to proceed through natural processes, without assistance from man. Because of the nature of the disturbance at some sites, and the harsh environmental factors present, some sites will not be rehabilitated for decades or even centuries. Increased alteration from erosion, invasion by exotic plants, and other factors, may occur on some sites. In certain situations no action or natural rehabilitation may be the best alternative. No action is preferable to unproven action.

b. Site Specific Rehabilitation Plans. Under this alternative, each situation requiring rehabilitation will be viewed as unique, and will be evaluated to determine the correct course of action. If a program requiring revegetation work is considered necessary, only species native to that ecosystem will be utilized. When necessary, research techniques should be employed to determine the action necessary for successful, ecologically sound restoration of the site. To facilitate restoration work, two greenhouses, one on the east and one on the west side of the Park,will be utilized. These facilities will be especially useful in providing a source of vegetation for use in restoration of alpine and sub-alpine areas. Native seeds will be collected in the Park, when feasible, to insure that genetically suitable plants are utilized. This alternative will insure that action will be taken on at least some of the existing disturbed sites in the Park, and that action will be based on carefully formulated plans.

4. Recommended Course of Action. Alternative b is recommended. Site specific rehabilitation should continue, except in cases where no action may be indicated as preferable to unproven methods.

a. Resource Management: Continued restoration of disturbed sites will limit the alteration of the natural system in these areas.

b. Monitoring: All disturbed sites caused by construction, fire, camping, trails, etc. will be monitored and documented. Quantitative analysis of impacts will be monitored. (See GLAC-004 Backcountry Management).

c. Research: Research will continue to develop techniques for successful, ecologically sound restoration.

Commitment to Accomplishments:

FY 1983: Continue to monitor disturbed sites and rehabilitate where practical

FY 1984: Continue to monitor disturbed sites and rehabilitate where practical

FY 1985: Continue to monitor disturbed sites and rehabilitate where practical

FY 1986: Continue to monitor disturbed sites and rehabilitate where practical

FY 1987: Continue to monitor disturbed sites and rehabilitate where practical

1. GLAC-N-007 VEGETATION Management

B. McGee Meadow

2. Statement of Problem. Degradation of rare sedges and harrassment of wildlife along with undesignated trail development has threatened the unique ecological value of the meadow. McGee Meadows are a sensitive area, approximately five miles from Apgar on the Camas Road. In the past this has been an area of interest because moose, elk and deer are often seen in the meadows.

There is an overlook adjacent to the meadows with an exhibit that explains the formation of the meadows and the eventual transition from meadow to forest.

In March of 1979, the Park received six McGee Meadow sedge specimens from Dr. A. E. Schuyler (The Academy of Natural Sciences). Two specimens are unique in that one, Carex atherodes Spreng., is new to the Park and C. chordorhiza L is new to Montana. Schuyler has written a short note for the journal "Rhodora" mentioning the McGee Meadow sedges. Dr. Schuyler states "McGee Meadow has an assemblage of rare plant species and I think it should be considered as a unique ecological area."

There are some undesignated trails developing into the meadows as a result of visitors venturing out into the meadows from the Camas Road Overlook. There is also an abandoned vehicle primitive tread road adjacent to the north side of the meadows, which connects the inside North Fork Road with the Camas Road. This section of road was proposed as part of a loop Camas snowmobile route several years ago, and has been used as a ski touring route.

Flathead County now maintains the North Fork Road to Polebridge and improvements in the future which may result in much heavier use of the Camas Road.

The McGee Meadows area is presently managed as other Park road area overlooks. The area has no special designation. It receives frequent road patrols in early spring, due to bears frequenting the vegetation along the Camas Road; however, there are fewer patrols as the visitor season progresses.

3. Alternative Actions and Their Probable Impacts.

a. No Program. This will result in undesignated trail development into the meadows and harassment of wildlife and possible damage to rare sedges.

b. Designate the area as a unique ecological unit, as suggested by Dr. Schuyler. This would require extensive management to preserve the area. This designation could result in a recommendation to eliminate the overlook, if increased patrols and signing were not adequate to preserve the area as a special ecological unit.

c. No Action. Continue present management. Place signs informing visitors not to walk in the meadows. Patrol in the area to assure that visitors adhere to the signing. When possible, conduct research to determine extent of rare sedges and the sensitivity of the area, and develop an inventory of McGee Meadow plants.

4. Recommended Course of Action. Alternative c is recommended at this time. This alternative will allow visitors to enjoy the meadow and its wildlife, while still preserving it's unique attributes. It also provides for an inventory of plant species in the meadow.

a. Resource Management: Make sure adequate signing is present, informing visitors of the uniqueness and value of the meadow. Conduct plant inventory.

b. Monitoring. Monitor use at Overlook.

c. Research. Conduct research to determine extent of rare sedges and the sensitivity of the area.

Commitment to Accomplishments

FY 1983 - Monitor meadow and assure that visitors adhere to restrictions.

FY 1984 - Complete plant inventory.

FY 1985 - Complete plant inventory.

FY 1986 - Complete plant inventory.

FY 1987 - Complete plant inventory.

1. GLAC-N-008 AIRSHED Management

2. Statement of Problem

Air quality is a significant issue at Glacier National Park and has the attention of a diverse local, national and international public. Air pollution has been identified by State and Federal agencies as a serious external threat to Glacier National Park, potentially affecting visibility, flora, fauna, and aquatic resources. Evidence of gaseous and particulate pollutants from sources outside the Park have been found in the Park biota. Under provisions of the Clean Air Act, Glacier was designated as a Class I area. Class I allows very little additional deterioration of air quality. However, before any deterioration can be detected baseline data must be available. It is the purpose of this Plan to present means that can be employed to gather data on the existing air quality and monitor the necessary parameters to detect any future deterioration which might occur.

Man's history has been one of first conforming to his physical environment then attempting more and more successfully to reshape that environment. Only recently has man developed the ability to alter the environment on a scale that may endanger his public health and welfare. The Clean Air Act of 1963 and major amendments in 1970 and 1977 were established by Congress after determination that the Nation's air quality was rapidly deteriorating, and Federal leadership and financial assistance were needed to cope with the problem. For the first time Federal law regarded air as a resource, the use of which must be carefully managed and planned.

The stated purpose of the Act is to protect and enhance the Nation's air quality. Goals are to attain and maintain National Ambient Air Quality Standards (NAAQS) increments for Prevention of Significant Deterioration (PSD) and natural visibility. The primary Federal responsibility is to provide technical and financial assistance to State and local governments who have the responsibility to develop and execute air pollution prevention and control programs.

a. The State Implementation Plan (SIP) is a Plan required by the Clean Air Act (CAA) that the State submits to Environmental Protection Agency (EPA) that demonstrates how the State will attain and maintain National Ambient Air Quality Standards (NAAQS). EPA and the State set standards for total suspended particulate (TSP), nitrogen dioxide (NO_2) sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_x) and lead Pb). Others such as visibility, hydrogen sulfide (H_2S) and fluoride (F) are also addressed. Section 118 of CAA indicates all Federal facilities must comply with SIP in the same manner and to same extent as any Government entity.

b. Part C of the Clean Air Act is entitled "Prevention of Significant Deterioration of Air Quality." Among the stated purposes of this part is to "preserve, protect and enhance the air quality in national parks, national wilderness areas, national monuments, national sea shores, and other areas of special national or regional natural, recreational, scenic or historic value." As a part of this preservation effort, the CAA established three classifications of varying degrees of restriction of allowable air quality deterioration in clean areas. Glacier National Park was designated Class I. Class I allows very little additional deterioration of air quality. Section 165d gives Federal land managers affirmative responsibility to protect air quality related values, which are resources that are or could be damaged by air pollution, i.e., water, visibility, flora, fauna, geology formations, and cultural resources.

c. In Section 169A of the CAA, Congress established a National goal to prevent future and remedy existing impairment of visibility in mandatory Class I Federal areas, where such impairment resulted from man-made air pollution. The Federal land manager needs to work closely with State air quality personnel, in developing a visibility monitoring program. Fire and smoke management policies are an important area of cooperation.

The quality of the air in the parks plays a vital role in both visitor enjoyment and perpetuation of historic or natural resources. Efforts will be made to control, mitigate or eliminate adverse alteration of the air quality of the parks by industrial/mechanical sources.

It shall be the policy of the National Park Service to protect and enhance the quality of the air resources in the National Park System by ensuring compliance with directives, regulations and applicable requirements of the Clean Air Act, (42 U.S.C. 1857 et seq.).

The Glacier National Park Statement for Management (8/7/81) declares, in part, "The management of Glacier National Park will seek to perpetuate the Park's outstanding scenery, vegetation, diverse wildlife and physical resources, as a natural area and in consonance with its status as a World Biosphere Reserve and to provide for visitor enjoyment in a manner which minimizes the adverse affects of human activities on their resources. . . and to preserve Class I air quality standards by establishing baseline data and initiating appropriate action against any activity within or without the Park which threatens a deterioration of air quality."

Glacier National Park is a member of the Montana State Airshed group, which is composed of Federal and State agencies and private industry. The members of this group all have an interest in the use of fire in resource management and are dedicated to the preservation of air quality in Montana. Participants in the State Airshed Group have signed a Memorandum of Agreement, the objectives of which are:

1. To minimize accumulation of smoke resulting from prescribed burning, and to encourage the development of alternative methods when practical.

2. To develop a Smoke Management Plan for reporting and coordinating burning operations on all forest and range land in the State.

3. At the end of each burning season, to evaluate the program, review the Agreement, and improve the Smoke Management Plan, where feasible.

Glacier National Park is a member of an Interagency Environmental Monitoring Committee for acid deposition in Montana. The group will seek to compliment each others mutual data-gathering efforts, share data collected with other members and coordinate Montana effort with regional efforts.

The Federal Land Manager (FLM) must monitor the resources to carry out basic management role. Air quality monitoring is an inventory of the air resource. We need to determine existing conditions from which future trends can be projected. The air quality of a specific area can be characterized by collecting and analyzing a sufficient number of representative samples of ambient air to evaluate air quality. Accurate baseline monitoring is essential because after a new source is built, data can help determine if the new source is affecting the unit.

Eventually, the Federal Land Manager must be able to determine, not only if resources are being adversely affected by air pollution, but be able to quantitatively assess adverse impact to determine its significance.

Air Quality monitoring in Glacier National Park is carried out by the West Lakes District Resource Management Ranger, who is the Air Quality Coordinator for Glacier National Park. He also serves as a member of the Interagency Monitoring Committee and State Airshed Group.

The objectives of Glacier's Airshed Program are:

1. Gather baseline levels of fluoride, particulates, sulfate, nitrate, deposition acidity, visibility and sulfur dioxide.

2. Measure trends over at least five years.

3. Determine if air quality-related values are affected by trends in air pollution.

A. Fluoride

Available evidence supports the view that fluorides are pollutants with considerable potential for producing ecological damage. The compounds are potentially serious contaminants not only when present in highly localized, massive concentrations, but also when distributed in low level amounts over a long period of time. Fluoride accumulation has been demonstrated in insects and in birds and mammals that feed on plants in the vicinity of pollution sources. Levels of fluoride pollution capable of leading to significant accumulation in plants may exhibit tissue death, inhibition of growth in stems and leaves or more susceptibility to disease or insects.

The Anaconda Aluminum reduction plant in Columbia Falls, Montana (a subsidiary of Atlantic Richfield Oil Company) is the largest source of fluoride emissions in the State of Montana. In 1955, the plant began operations. A consequence of the electrolytic reduction process used in the plant is the generation of gaseous and particulate fluoride emissions.

By 1957, foliage injury to tress near the aluminum plant was alleged to be due to fluoride fumes from the reduction works. From 1965-1969, increased emissions of fluoride followed plant expansion. Visible injury to flora was detected in the southwestern part of Glacier National Park, which at its nearest point is six air miles northeast of the aluminum plant. In 1969, the first actions were taken by Federal, State and private sources to monitor airborne fluorides inside Glacier National Park.

Research and monitoring of fluorides within Glacier National Park has been in effect since 1970. Results indicate high levels of ambient fluoride occurred in the Park, that accumulated in plants, animals, and soil above normal levels. Damage to plants was documented in 1971, and was still detected in 1978. Monitoring showed a general decrease in emissions until 1975, then a substantial increase through 1979. With the installation in 1980 of a scrubber system to control gaseous fluoride emissions, a significant reduction in ambient levels was detected.

Results of fluoride monitoring by Glacier National Park and Anaconda Aluminum personnel for 1980 and 1981, show fluoride levels within the Park to average well within State standards.

Although research and monitoring indicate emission levels have been greatly reduced at the Anaconda Aluminum Plant, little is known about effects of fluoride and other pollutants on air quality-related values at Glacier National Park. Since it is believed fluoride accumulates in plants and animals, effects may be subtle over a period of time. Until such time as these ambient fluorides no longer impact the Park, both ambient and vegetation monitoring should continue to operate as now.

The Montana Board of Health and Environmental Sciences recently approved a vegetation standard for fluorides of 35 micrograms per gram grazing season average with no monthly average to exceed 50 mg/g. Although the State standard is based on forage vegetation for cattle, forage sampling in the Park was initiated in 1982.

Three forage sites are identified and sampling done twice a month from June to September. Also, vegetation samples are taken at five sites five times a year for conifer, shrub, forb and grass. Vegetation and forage samples are sent to the Montana Air Quality Board for analysis and a summary provided to the Park.

Previous sampling methods using calcium formate papers are not applicable to the new standard, but they do serve a value in monitoring ambient fluoride levels. There are ten sites in the Park where 10 cm filter paper impregnated with calcium formate is installed to measure trends in gaseous fluoride. The papers are changed once a month and sent to the Montana Air Quality Board for analysis. A printout is mailed to the Park quarterly.

The Anaconda Aluminum Plant does fluoride sampling with Glacier National Park through a yearly cooperative agreement. They operate a bicarbonate tube and have fifteen vegetation sampling points. Data from monitoring done by Anaconda is sent to the Park in a yearly summary report.

B. Sulfur Dioxide

Sulfur dioxide is a colorless gas produced when a sulfur containing material is burned in the presence of oxygen. Manmade sources of sulfur dioxide include fossil fuel combustion (coal, oil, gas), pulp and paper milling, petroleum refining and copper, aluminum and lead smelting. Natural processes also release sulfur in the form of hydrogen sulfide from biological decomposition and sulfates from oceans and volcanic eruption.

At concentrations above three parts per million (7800 micrograms per cubic meter) SO_2 has a pungent odor. However, that is 100 times greater than National primary ambient air quality (annual) standard for SO_2, established to protect public health. The gas which emits a tell-tale odor which is being detected at Glacier is probably hydrogen sulfide, which is a biproduct of petroleum refining, among other things.

Sulfur dioxide can cause both chronic and acute injury to vegetation. It also adversely affects human health, inflaming membrane tissues of the nose, throat and lungs. When it combines with water in the air it forms a weak solution of sulfuric acid, commonly known as acid rain. Compounds of sulfur may be converted to sulfate by chemical reaction. As a particulate, sulfate can affect visibility and public health.

Extensive oil, gas, and coal exploration in Montana, North Dakota and Canada has resulted in numerous sources of pollution around Glacier National Park. The Montana Air Quality Bureau feels sulfur dioxide is a major concern for Glacier National Park.

It is uncertain whether operations at the proposed Sage Creek Coal Mine northwest of Glacier National Park in Canada may exceed National ambient air quality standards and PSD increments for SO_2 and TSP, or may have a possible adverse impact on the Park's visibility. Additional information has been requested from the Canadian Government.

Monitoring for sulfur dioxide at Glacier National Park is by sulfation plate and continuous sampler. A network of twelve sulfation plates was installed in 1982, at various elevations in the Park to establish trend levels. They are changed once a month and an analysis done by the Montana Air Quality Board with a report submitted once a year.

The Anaconda Aluminum Company of Columbia Falls operates a continuous thermoelectron SO_2 sampler at the West Glacier Fire Weather Station, and provides data summary once a year. Should Anaconda at some future time decide to cease such monitoring, the Park will work with the WASO Air Quality Division-Denver, and the State of Montana to install and operate a replacement monitor of SO_2 is a continuing threat. Sulfates are monitored with three hivol samplers.

Effects of SO_2 emissions on Park resources is unknown. British Columbia initiated a lichen study in Canada in 1983. The National Park Service Air Quality Division initiated plans to begin effects research utilizing lichens as indicators in 1984 within Glacier National Park.

C. Particulates

Total suspended particulates (TSP)refers to all particles suspended in the atmosphere. Particulates are composed of many elements and chemical compounds, many of which are toxic or carcenogic. Fine suspended particulates of 2mm or less can impair visibility, damage vegetation, wildlife and natural systems, and severely affect public health.

Sources of particulates include fossil fuel combustion, auto emissions, agricultural and forest burning, forest product industry, wood stoves, unpaved roads and windblown soil. In combination with other pollutants, particulates can have a combined increased impact. The Montana Air Quality Board believes the Sage Creek Coal Mine may exceed National Ambient Air Quality Standards and PSD increments for TSP and may also have an adverse effect on visibility.

Monitoring for total suspended particulate at Glacier National Park is by hivol and fine particulate samplers. Three hivol samplers are operated by Park personnel at the West Glacier Fire Weather Station, Polebridge and St. Mary. Anaconda Aluminum Company also operates a hivol at West Glacier. Filters are changed every six days and sent to the Montana Air Quality Board for analysis of total suspended particulate, sulfate and nitrate. Printouts are sent to the Park once a year.

A SFS-500 fine particulate sampler was installed at the West Glacier Fire Weather Station in 1982, as a part of the visibility monitoring program.

Results of monitoring have shown low levels of nitrate and infrequent violation of TSP standards. Some high levels of sulfate have been detected at St. Mary of over 50% TSP, although the average is 26% - 34% TSP. The data seems to indicate there are distance sources of sulfur emissions that are detected in Glacier National Park in the form of abnormally high levels of sulfate.

D. Visibility

Visibility is important at Glacier National Park, due to its rugged mountain scenery and expansive views. The quality of visibility is often judged by how far we see on a given day, and how distant or clear the object we are viewing appears, compared to how it looks on other days. The impairment of visibility is caused, primarily, by fine particulate matter, which, primarily scatters light, or by nitrogen dioxide, which absorbs light. The objectives of visibility monitoring are: 1) to determine the impact of existing emission sources on visibility; and 2) to develop a visibility data base, which might be required for PSD permit review Visibility is monitored in terms of contrast and standard visual range.

The Park completed identification of its significant scenic views, and submitted the descriptive package of those views to the Air Quality Division in July 1982.

Initial monitoring results should be available in 1983. No conclusions can be made regarding this monitoring until then.

The Montana Air Quality Bureau believes visibility at Glacier National Park may be impaired with the operation of the Sage Creek Coal Mine. Smoke from forest fires in Canada have periodically affected visibility thoughout the Park. Smoke from fire management practices on Federal and State lands within Montana have affected Glacier, although the State Airshed Group has kept this to a minimum.

E. Acid Deposition

Acid rain, or more properly, acidic wet and dry deposition, pose a threat to many resources of the National Park System. Potential damage to natural systems, include decline in fish populations; lowering of plant productivity, soil decomposition rates, and animal reproduction; and deterioration of man-made materials.

Acid rain is wet precipitation with a ph below 5.6. As a result of combustion of fossil fuels, sulfur and nitrogen oxides are emitted into the atmosphere. Through a series of complex chemical reactions these pollutants can be converted into acids, which may return to earth in dry or wet form. For acid rain to be a problem, there not only must be wetfall with a lower than normal ph, but there must also be a sensitive receptor.

The key to sensitivity of any natural resource is buffering capacity, which is the ability of the resource to alter or neutralize the incoming acids, before they have affect, Sensitive areas include mountain portions of Appalachia, Rockies andthe Pacific Coast Range.

Although monitoring of acid deposition has been in effect in the United States sinc 1959, an extensive national network was initiated in 1978. Today, there are 121 National Atmospheric Deposition Program (NADP) sites operating in the United States and 21 are in National Park Service areas. The NADP site at West Glacier Fire Weather Station has been in operation since 1980. Another site will be established at St. Mary in 1983.

The Environment Canada-Atmospheric Environment Service has a collector for their Canadian Network for Sampling Acid Precipitation (CANSAP) for gathering comparison data at a NADP site. The CANSAP collector was in operation in April of 1981. Monitoring work in acid deposition is done by Glacier National Park personnel, with analysis and printouts done by the National Atmospheric Deposition and Canadian Network for Sampling Acid Precipitation networks. Samples are changed once a week at NADP site and the day after each precipitation event for the CANSAP site.

Two years of NADP monitoring at Glacier National Park show approximately 63% of deposition samples have a ph between 4.75 and 5.50 with an average about 5.3. Therefore, this station receives acid deposition, but not enough information is known to pinpoint sources or the affects on the ecosystems.

The St. Mary station will help determine a comparison in acid deposition, between the east and west sides of the Continental Divide. A comparison of NADP and CANSAP data at West Glacier is not yet available.

3. Alternative Actions and Their Probable Impacts

A. No action. This would result in a retrogressive program. The loss of information would leave Park personnel with no means of assessing any future deterioration of air quality. Such action is not in the best interest of Glacier National Park, nor in line with the policies of enhancing the quality of the Parks' air resources.

B. Continue Present Program. The present program emphasizes gathering baseline data through monitoring of current conditions. Although minimally funded, effects research exists with vegetation and forage sampling for fluoride.

C. Expand Present Program. Because of the possible added impacts (beyond those already affecting Park resources) of SO_2 emissions from the Sage Creek coal mine complex in Canada and increased oil and gas development north, east and west of the Park, it is necessary to continue the present monitoring program and expand the effects research program to include SO_2 effects. We also need to widen our involvement in State and local air quality issues, in order to fulfill our responsibilities of air resource management under the Clean Air Act.

4. Recommended Course of Action.

Alternative C is the preferred choice, because it will provide a more complete airshed program and needed emphasis on air resource management.

Resource Management

a. Montana Air Quality Board will provide a computer printout of monitoring results once a year, and a histogram of all data for TSP, sulfate, nitrate, fluoride and SO_2 in the State computer by September 30, 1983.

b. Glacier National Park will utilize the Park computer to compile a summary of all data not in the State computer by April 30, 1983.

c. Analyze sulfate and SO_2 data for at least one year, before initiating any additional continuous monitoring for SO_2 in the North Fork or east side of the Park.

d. Improve air quality communications with Parks Canada and Environment Canada.

e. Keep Blackfeet Indian Tribe informed on what we are doing in air quality

f. An emission inventory will be provided by the Montana Air Quality Bureau that will include H_2S, SO_2 and particulate point sources.

g. Coordinate sensitivity report on Park waters to acid deposition with Jack Stanford of the University of Montana and NADP.

h. A cooperative agreement with Montana Air Quality Bureau will be consumated in 1983, that will indicate areas of mutual exclusive responsibility with regard to the protection and enhancement of the air quality of Glacier National Park.

i. The Airshed Management Plan and Smoke Management Plan will be rewritten in 1983.

j. Opportunities for receiving funds from Northwest Power Bell will be explored.

k. Submit request to fund a full time air quality coordinator.

l. Continue membership in State Airshed Group and Interagency Monitoring Committee.

Monitoring

1. Until existing data can be analyzed and reviewed, continue existing monitoring for fluoride to establish trend levels for several years following installation of a scrubber system at the Anaconda Aluminum Company plant.

2. Consult with NPS Air Quality Division for funds to do fluoride, particulate and sulfur dioxide monitoring, since this work has been accomplished in the past, utilizing special initiative and visibility funding allotments.

3. Have the NPS Air Quality Division review the agreement with Anaconda Aluminum Company to perform monitoring in the Park with the provision we have access to data in a year-end report.

4. Propose to the National Park Service Air Quality Division expansion of the existing network of sulfation plates to include sites at Kishenehn Patrol Cabin, Waterton Townsite (or Chief Mountain Customs Station), and Hudson Bay Divide.

5. Continue existing use of hivol samplers and fine particulate sampler.

6. Request funding from MPS Air Quality Division for a fine particulate monitor in the North Fork.

7. Existing visibility program is adequate for providing data that the State could use if a problem is identified.

Research

1. Consult with NPS Air Quality Division regarding studies to assess environmental risks of low level fluoride pollution. Priorities include effects on food chains and sub lethal toxic effects on terrestrial, soil and aquatic ecosystem.

2. Effects research utilizing lichens to establish baseline condition with regards to SO_2 emissions is scheduled by NPS Air Quality Division to be initiated in 1984.

3. Initiate effects research on sensitivity of resources to acid deposition and apply for adequate funding.

4. Initiate a study to monitor ph of snowpack prior to spring melt, coordinated with snow surveys and NPS water resources lab.

5. Commitment to Accomplishments

FY 1983

a. Rewrite Airshed Management Plan and Smoke Management Plan.

b. Emission inventory of point sources and histograph of existing data will be completed by MAQB.

c. Improve air quality communication with Canada and Blackfeet Indian Tribe.

d. Monitor pollutants to gather baseline data for SO_2, TSP, sulfate, nitrate, visibility, acid deposition and fluoride.

e. Initiate requests to the NPS Air Quality Division for effects research on acid deposition, fluoride and SO_2.

f. Consummate Cooperative Agreement with MAQB.

g. Submit supplemental funding requests.

h. Update Agreement with Anaconda Aluminum Company.

FY 1984

a. Continue monitoring of pollutants defined in Airshed Management Plan.

b. Continue effects research or initiate if not started in 1983.

FY 1985 - Same as FY84.

FY 1986 - Same as FY84

FY 1987 Same as FY84.

1. GLAC-N-009 WATER QUALITY MANAGEMENT

2. Statement of Problem: An important component of the Glacier Park ecosystem is the complex of lakes and streams which comprise the aquatic resource. More than a thousand miles of rivers and streams blend together a diverse assemblage of lakes, ponds and marshes, producing a variety of aquatic environs throughout an elevantional gradient extending from 900 meters to over 3,000 meters. The headwaters of three Continental drainages originate within the Park boundary, creating a unique mix of aquatic and riparian biotas.

Although Federal water quality standards applicable to the National Parks have not been adopted, Federal areas are required to conform to appropriate State standards. The Montana Department of Health and Environmental Sciences has placed Glacier Park waters in the "A-Open, DI-1" classification (i.e., the highest quality) as part of their Statewide classification scheme.

Water quality concerns in Glacier Park fall broadly into three categories: (1) internal land uses, (2) external land uses, and (3) airborne particulate pollution originating from activities taking place outside of the Park.

Internal Land Uses. Facilities construction and maintenance inevitable produce impacts on water quality. In some instances, the impacts are short-term and minor (i.e., road sanding), while other disturbances are significant and essentially permanent (i.e., roadways, campground construction, siting of lodges, buildings, etc.). Sewerage treatment near developed facilities and at heavily used backcountry sites (i.e., chalets), or the lack of such treatment, are important determinents of water quality. Dispersed recreational and administrative activities within the park, including the use of horses and pack stock, also impact natural waterways. Collectively, these activities produce physical alterations (i.e., sedimentation), chemical changes (i.e., nutrient enrichment) and biological impacts (i.e., bacterial pulses, etc.). Thoughtful planning and periodic water quality monitoring are the principal forms of management for these activities.

Maintenance. Wastewater treatment facilities have been constructed at St. Mary, Many Glacier, and Headquarters. The Headquarters system serves Apgar and Lake McDonald. Many Glacier has aerated lagoons with percolation evaporation pond disposal, St. Mary has an activated sludge system with percolation evaporation pond disposal and Headquarters has an aerated lagoon with spray field disposal. These systems have a ground water monitoring well system around the effluent disposal sites. The U.S.G.S. has been involved in the development of the ground water monitoring system and has reported, "No significant impact" to the Park water resources.
Additional emphasis is needed in the ground water monitoring program to insure all conditions are evaluated on a continuing basis.

New construction in 1983 will bring wastewater from Rising Sun to the St. Mary treatment plant for treatment and disposal.

External Land Uses. Land management practices outside of the Park can produce major impacts on waters flowing in and adjacent to Glacier. Logging in southern British Columbia, Canada, as a means of salvaging thousands of acres of beetle-killed timber is occurring close to the Park's northern perimeter, in some instances

to within a few hundred feet of the boundary. Logging is also taking place in the headwaters of several streams which enter the northwest corner of Glacier Park and flow to the North Fork of the Flathead River.

Increased sediment loads and elevated thermal regimes are the impacts most often associated with extensive logging near streams. Water temperatures rise because loss of the vegetative canopy exposes streams to increased solar radiation. Increased sediment loads are transported by streams as a result of erosion caused by subsequent rains which wash silt from cut-over slopes into nearby waters.

The Park's efforts to deal with these problems through negotiation, and perhaps litigation, will necessarily be based on credible data documenting stream alteration. Recording thermographs have been installed in several of the affected streams to log temperature data. Sediment monitoring, however, is a much more complex issue. Sediment sampling by conventional means is impossible due to logistical considerations (i.e., remoteness of sites), and automated equipment to accomplish this task is prohibitively expensive. Moreover, the reliability of such equipment under severe winter conditions is questionable. Perhaps, though, the greatest shortcoming of automated sediment monitoring is its inability to detect transient movements of silt, which may vary according to the amount of upstream site disturbances and local precipitation. Park Scientists are working with biologists at the Yellow Bay Biological Station on several experimental sediment monitoring techniques in order to overcome these problems. In the meantime the Park, in conjunction with U. S. Fish and Wildlife Service biologists, has taken another approach to the sediment problem. Instead of attempting to monitor sediment itself, we are measuring the effects of sediment through periodic examination of the aquatic microbiota. Stream invertebrate communities are extremely sensitive to environmental conditions, responding rapidly to thermal changes and excess siltation. The advantage of this approach is that it is sensitive to transient as well as sustained upstream disturbances. Water quality degradation will be indicated by changes in species composition, and in the relative abundance of various "indicator" species. The disadvantages are that invertebrate work is labor-intensive and, hence, is moderately expensive; and the damage is documented after-the-fact. Nonetheless, this appears to be the best interim approach pending development of improved methods for sediment monitoring. Between 1979 and 1981, aquatic invertebrate inventories were made on the four North Fork streams which could be affected by logging in Canada and follow-up work is in progress to develop temperature and hydrographic data (i.e., discharge measurements).

The potential is also great for coal mining in Canada to adversely impact the North Fork. Leaching of sulphur and heavy metals into the river poses the main concern. Although Glacier National Park's North Fork lakes contain resident fish populations which are sufficiently isolated from the River to escape the direct effects of pollution, they could be indirectly affected over the long-term through loss of genetic exchange. The extent to which the fishery in the lower Flathead River-lake system contributes to the Park's interior fishery is unknown. It is likely that the reverse is more a factor; the Lake-dwelling trout populations within Glacier very likely contribute substantially to the downstream system through escapement. In any case, the Park has a vested interest in the North Fork of the Flathead River and any degradation of water quality through coal development, or from other causes, must be prevented.

Park scientists are involved in regular information exchanges with other agency personnel doing work on the North Fork, and in FY82 Glacier provided funds to extend the operation of a stream gauging station near the Canadian border for one additional year beyond the termination of EPA support.

Exploratory gas and oil drilling, the attendant road building, etc., as well as clear-cut logging, taking place on the U. S. side of the border, will also require close scrutiny in the years ahead to insure that these activities do not create additional water quality problems in the Park.

Airborne Pollution. (Also see Airshed Management GLAC-008) Airborne particulate debris from both distant and nearby sources poses an ominous threat to the water resources of Glacier National Park. Wet and dry-fall deposition of noxious materials has the potential to cause widespread damage. The most serious concern is acid-precipitation, nitrous and sulphur compounds which can be transported great distances by prevailing winds, and fall locally as rain or snow. Evidence of the biological damage which can be caused by acid-rain is well documented throughout central Europe and, more recently, in the Adirondack Mountains in the eastern United States. Entire aquatic ecosystems, including valuable salmonid fisheries, have been devastated. Acid-rain is the most serious long-range aquatic resource concern in Glacier National Park.

Relatively little data are available which would have any utility for adjudication in cases involving acid-rain damage to Park resources. Glacier personnel have been monitoring acid-rain since 1979, through the operation of an official NADP Station, however, this system is limited to pH measurements of precipitation at a single location. Measurements indicate that Glacier Park is receiving acid-precipitation. No studies have been made to assess the sensitivity of the Park's aquatic ecosystem to pH alteration, and/or to document damage which may already have taken place. Industry proposals for the construction of coal-fired power plants in eastern Washington and in Alberta, Canada, forebode difficult times ahead. The need for research in this area is critical.

3. Alternative Actions and Their Probable Impacts:

A. No Program. Termination of water quality research and monitoring activities in Glacier would place the aquatic resource in jeopardy. The acquisition of credible scientific data serves as a deterrent against would-be polluters, and where negotiation fails, is essential to a favorable outcome in litigation.

B. Base Line Date Gathering - Mainstream North Fork. Either through direct participation by NPS scientists or via contract arrangements, baseline data would be gathered on fishery resources, aquatic invertebrates, water chemistry, physical habitat, or all of the above. The distinguishing feature of this alternative is that the work would be performed on the main stem North Fork. Periodic follow-up monitoring would be necessary to validate this activity. Data of this kind would permit the NPS to join forces with other land-management agencies to prevent or litigate damage to the main-stem North Fork.

C. North Fork Tributaries Monitoring. Under this alternative, baseline data (biological, physical, chemical) would be gathered on those North Fork streams

immediately threatened by logging activities in British Columbia. The affected steams are Sage, Spruce, Kishenehn, and Starvation Creeks. This could be accomplished by Park scientists, collaborative investigators, or a combination of both. Periodic follow-up monitoring would be necessary to validate this activity. Such data would greatly enhance the Service's efforts to deter harmful land-management practices occurring upstream from the Park and/or seek relief for damages through litigation.

D. Sewerage Impact Study. This alternative would involve a park-wide study, or a series of individual unit studies, to assess aquatic resource damages, due to inadequate sewerage treatment, and to document the effectiveness of existing treatment facilities. Funding requirements would be proportional to the scope of the investigation(s). Data produced from studies of this kind would be useful for mitigation of sewerage impacts on Park waters.

E. Acid-Rain Study. Studies would be made on selected Park waters to: (1) evaluate resource damage already incurred as a result of acid-rain, (2) assess the sensitivity and buffering capacity of the aquatic resource, (3) acquire baseline data for detection and measurement purposes, and (4) provide an assessment of the biological consequences of acid-precipitation. Considerable latitude exists for adjusting the scope of such studies, however, a moderate funding level would be required.

F. Baseline Water Quality Study. This alternative would provide for the gathering of limited physical, chemical, and biological water quality data beyond the present level of routine inventory work. Minimal funding would be required. Studies could either take the form of time-series sampling from a few selected waters, or one-time only sampling from several waters. However, the latter approach would not provide much in the way of useful information. Time-series data gathered on any Park waters, geographically restricted or otherwise, would be useful for deterring or mitigating water quality problems affecting those specific waters.

G. Comprehensive Water Quality Study. This alternative encompasses the ideal water quality study, and would require a decade to complete under conditions of optimum funding and manpower resources. Time-series data would be obtained by monthly sampling over a one-year period at several stations on each significant Park drainage. Included would be detailed measurements of all important physical and chemical parameters and limited biological data. Information from the study would be eminently useful to Park managers for addressing a broad range of existing and potential water quality problems. However, an undertaking of this magnitude may be prohibitively expensive.

4. Recommended Course of Action. It is recommended that several of the alternatives be implemented, the extent of which will depend upon funding availability. Alternative A is rejected because the "no action" alternative essentially mandates Park officials to ignore threats to Glacier Park's water resources.

The gathering of baseline data from the main-stem North Fork, Alternative B, will be a useful strategy for pressuring Rio Algom Ltd. to mine coal in a manner that does not cause significant degradation of water quality. However

since the National Park Service shares management responsibility for the main-stem North Fork with several other resource agencies, research and monitoring activities will have maximum credibility when undertaken jointly with the other involved agencies. National Park Service funding of the "Border" water quality monitoring station during CY-1983 is an excellent example of Park participation in a cooperative project. Through this arrangement, the Yellow Bay Biological Station (University of Montana) is contracted by the Park to perform the water analyses; previously the work was funded by EPA under the auspices of the Flathead River Basin Study.

Continued monitoring of water quality is recommended for the tributary streams draining to the North Fork from Canada which pass through the northwest corner of Glacier Park. Several of these streams including Sage, Spruce, Starvation, and Kishenehn Creeks, originate in portions of British Columbia where extensive logging is taking place. Some baseline data have already been collected (fisheries, aquatic insects, etc.), and additional work is in progress; however, year-round data collections, even for such basic parameters as water temperatures, chemistry, and discharge, are logistically difficult to obtain and it is likely that some gaps will exist in the data. The goal for these streams should be acquisition of at least two continuous years of data on water chemistry, temperature regimes, and discharge rates. Periodic follow-up studies should be made to monitor possible changes in the aquatic insect faunas. Meanwhile, experimentation with various sediment monitoring technologies must proceed.

A few small scale studies have been made to assess sewerage impacts on the resource and to evaluate the effectiveness of treatment facilities within the Park. Continuation of these efforts as described in Alternative D is recommended.

The highest priority must be accorded efforts to secure funding for acid-rain research in Glacier Park. The potential seriousness of this problem is such that studies described under Alternative E should be planned as soon as possible and initiated immediately upon receipt of funding. The necessary studies will be moderately expensive and require from three to five years to complete. A reduced level of follow-up monitoring will also be necessary to stay abreast of this problem.

There is a clear need for time-series water quality data for most, if not all, of Glacier Park's surface waters. However, the choice between alternatives F and G is not a simple one. The recommended course of action is to develop contingency plans for both approaches and allow the choice to be determined by the level of funding obtained for water quality monitoring. Since the ideal study under Alternative G is apt to cost several hundred thousand dollars, the baseline studies described under Alternative F represent the course which should be pursued in the short-run. Efforts must proceed, nonetheless, to obtain adequate funds for a Parkwide water quality study. A decade or more would be required to complete such a comprehensive project, thus, the work plan should be designed incrementally and budgeted accordingly into the Park's funding base.

Commitment to Accomplishments:

FY-1983. Glacier Park has provided funds to the University of Montana for

operation of the Border water quality monitoring station through December, 1983. Baseline data will be collected by the Aquatic Ecologist on Kishenehn and Starvation Creeks on the North Fork. Research and Resources Management personnel will work cooperatively to prioritize and seek funding for the remaining water quality concerns identified above. Continuation of U. S. Fish and Wildlife Service water investigations in Glacier Park.

FY-1984 Continuation of baseline studies on Kishenehn and Starvation Creeks; expand to include Sage and Spruce Creeks. Designated staff personnel will intensify efforts to secure water quality funding and advance the planning process. Continuation of other work from 1983.

FY-1985 Continuation of work on Sage and Spruce Creeks on North Fork. Completion report for Kishenehn and Starvation Creeks to be prepared by the Aquatic Ecologist. Other studies (acid-rain, baseline studies, sewerage impacts, etc.) to be initiated as funding allows.

FY-1986 Completion report on Sage and Spruce Creeks to be prepared by the Aquatic Ecologist with recommendations. Continuation of other work from 1985 as funding allows.

FY-1987. Continuation of work from 1986.

1. GLAC-N-010 Aquatic Ecosystems Management

2. Statement of Problem: Half a century of fish stocking in Glacier National Park has resulted in the establishment of seven exotic species and subspecies. Nearly all Park drainages have been adversely affected to some degree. Exotic fish introductions into pristine aquatic communities produce two broad categories of impacts; (1) genetic contamination of indigenous gene pools through hybridization between native and exotic species, and (2) ecological disruptions wherein introduced species compete with and/or prey upon native species. Empirical evidence suggests that both factors may be casually related to the decline of native fish populations, especially salmonids (i.e., game fish) in Park waters. Exotic fish introductions may also have drastically altered the composition and relative abundance of indigenous aquatic invertebrate species. It is assumed that some plankton species have been extirpated in waters stocked with fish, which were historically barren of vertebrate planktivores.

Recent studies by the Staff Aquatic Ecologist have addressed the genetic concern as it relates to the native cutthroat trout, a species which is approaching extinction, throughout much of its historic range. Information is now available documenting the genetic identity of cutthroat trout populations remaining in Glacier National Park. Pending certain policy determinations (i.e., disposition of exotic salmonids), management actions can be undertaken to insure the long-term genetic integrity of the native cutthroat trout.

Other fishery problems are less well understood. For example, no data presently exists for assessing the ecological impact(s) of exotic species on native fish populations. The most obtrusive example where this problem exists is in the Lake McDonald fishery. A thorough study of this fishery would provide needed information on species interactions, habitat utilization, suspected pollution, condition of spawning habitat, etc. An investigation of this scope would not only yield important data, and possibly suggest some remedies for the Lake McDonald ecosystem, but will also provide useful insight into the broader problem of exotic and native fish interactions applicable to numerous other Park waters.

The genetic and ecological status of unique native fishes is another area where current information is inadequate. Status of the pigmy whitefish is unknown in several of the Park's westslope lakes, and there are indications that more than one strain of native bulltrout may exist in Park waters. Bulltrout populations in Upper Kintla Lake, Cracker Lake, and the Isabel Lakes, for example, may be unique and deserving of special management, A basic life-history study of the Upper Kintla Lake bulltrout population is especially needed, since preliminary analyses has confirmed that these fish are genetically distinct from their conspecifics, occurring elsewhere in the upper Flathead basin.

Aside from basic research, several ongoing programs may be broadly categorized as inventory and monitoring activities. The Park, in cooperation with the U. S. Fish and Wildlife Service, has for several years promoted a voluntary creel census to monitor the sport harvest of game species. This program has provided statistical data, which has contributed substantially to management decision-making, especially in the formulation of rules and regulations. Biological inventories are also routinely conducted in Park waters, by the U. S. Fish and Wildlife Service, including fish and invertebrate population sampling.

3. Alternative Actions and Their Probable Impacts:

A. No Action: All current and proposed aquatic management, research, and monitoring activities would be suspended under this alternative. Such an action would interrupt the progress made in fisheries management during the past decade. Moreover, this response would prevent the Park from fulfilling its legal mandate to maintain and restore natural conditions to the aquatic ecosystem to the extent possible.

B. Maintain An Active Aquatics Program: Continue present management, monitoring, and research activities to the extent that available funding will allow. Research and monitoring functions would be expanded somewhat as additional funding allows. This alternative would sustain a viable fisheries management program based on up-to-date information. Continued progress would be made toward the goal of rehabilitating selected park waters to a condition more closely resembling historic community structures. Unusual races or otherwise unique populations of aquatic species would be more secure in terms of their long-term survival.

C. Reduced Aquatics Program: Selectively reduce or eliminate some management, research, and monitoring activities, while allowing others to be sustained at their present level. Since aquatic research and fisheries management are necessarily inter-related, one function cannot be eliminated without seriously impacting the other. Monitoring activities are also important to effective management. Accordingly, the preferred approach under this alternative would be a general reduction of the aquatics program, rather than elimination of any individual component. Overall effectiveness of fisheries and aquatic resources management in Glacier National Park would be correspondingly diminished.

4. Recommended Course of Action: Alternative B is recommended. To the extent that funding will allow, research, monitoring, and management of the aquatic resource will be maintained at or above the present level.

A. Resources Management: Resources management personnel,with input from the Research staff, will adopt a firm policy for managing native, exotic, and hybrid fish populations in Park waters. Sufficient information exists for rehabilitation of selected trout populations, and/or return of some lakes containing introduced trout back to their historic fishless condition. Plans for a pilot project along these lines will be considered. Designated personnel will also coordinate with the U. S. Fish and Wildlife Service to discuss the joint establishment of a certified brood stock of native cutthroat trout at the Creston Fish Hatchery for future use in rehabilitation projects within Glacier National Park, and to assist other agencies in re-establishing this trout in waters outside of the Park. Periodic reviews will be made of Park fishing regulations to insure their adequacy in accomplishing fishery management goals. Resources Management personnel will work closely with the Research staff to insure that aquatic research planning is responsive to current management needs.

B. Monitoring. Continue the Voluntary Creel Census in conjunction with the U. S. Fish and Wildlife Service, since it is the most cost-effective means of acquiring information on the Park's fishery resources. Support the continued gathering of baseline aquatic inventory data by the resident Research staff and the U. S. Fish and Wildlife Service.

3. Alternative Actions and Their Probable Impacts:

A. No Program. All current and proposed aquatic management, research and monitoring activities would be suspended under this alternative. Such an action would interrupt the progress made in fisheries management during the past decade. Moreover, this response would prevent the Park from fulfilling its legal mandate to maintain and restore natural conditions to the extent possible to the aquatic system.

B. No Action. Maintain an Active Aquatics Program. Continue present management, monitoring and research activities to the extent that available funding will allow. Research and monitoring functions would be expanded somewhat as additional funding allows.

This alternative would sustain a viable fisheries management program based on up-to-date information. Continued progress would be made toward the goal of rehabilitating selected Park waters to a condition more closely resembling historic community structures. Unusual races or otherwise unique populations of aquatic species would be more secure in terms of their long-term survival.

C. Reduced Aquatics Program: Selectively reduce or eliminate some management, research, and monitoring activities, while allowing others to be sustained at their present level. Since aquatic research and fisheries management are necessarily inter-related, one function cannot be eliminated without seriously impairing the other. Monitoring activities are also important to effective management. Accordingly, the preferred approach under this alternative would be a general reduction of the aquatics program, rather than elimination of any individual component. Overall effectiveness of fisheries and aquatic resources management in Glacier National Park would be correspondingly diminished.

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B. Monitoring. Continue the Voluntary Creel Census,in conjunction with the U. S. Fish and Wildlife Service, since it is the most cost-effective means of acquiring information on the Park's fishery resources. Support the continued gathering of baseline aquatic inventory data by the resident Research staff and the U. S. fish and Wildlife Service.

C. Research. With appropriate guidance from the Resources Management staff, the Aquatic Ecologist will prepare research proposals and implement studies on selected topics. Scope and intensity of individual projects will be dictated by available funds. Aquatic research priorities for the period 1983-87 are reflected in the action plans described below in the Commitment to Accomplishments section.

Commitment to Accomplishments:

FY-1983. Continue creel census and biological inventories as joint NPS/FWS activities to expand baseline data. Resources Management staff will define long-term management goals for native and exotic fish species; discussions will be held with FWS to explore possible establishment of native cutthroat trout hatchery stock. Aquatic Ecologist will prepare proposals dealing with the Lake McDonald and Upper Kintla Lake fisheries. Field work will be initiated on the Kintla Lake study (minimal funds required); arrangements will be sought for funding of the McDonald Lake study. Final report dealing with cutthroat trout genetics research will be prepared by the Aquatic Ecologist. Management recommendations contained in the report will be considered for implementation by the Resources Management staff.

FY-1984. Continuation of monitoring and inventory work by NPS and USFWS biologists. Resources Management staff to followup on cutthroat trout management plans outlined in FY 1983. Upper Kintla Lake study continuation by Aquatic Ecologist. Initiate field work on McDonald Lake Fishery Study to extent that available funds allow.

FY-1985. Continuation of activities outlined in FY-1984. Aquatic Ecologist will prepare a research proposal for investigating the impact of exotic fish introductions on the native microbiota of Park waters.

FY-1986. Continuation of activities outlined in FY-1985. Funds will be sought for microbiota study with field implementation depended upon receipt of funds. Resources Management staff will review fishing regulations adopted in FY-1983 for adequacy and accomplishment of fishery management goals.

FY-1987. Continuation of activities outlined in FY-1986. Final year of Upper Kintla Lake fishery study with completion report due in 1988.

1. GLAC-N-011 RIVER USE Management

2. Statement of Problem. The Wild and Scenic River Act is a mandate for comprehensive land use and river management planning and places limits on structures and recreational developments in the river corridor. Substantial stretches of the North, Middle, and South Forks of the Flathead River system were added to the National Wild and Scenic River System in 1976. The entire western boundary of Glacier National Park is delineated by the North and Middle Forks of the Flathead, and these are embraced by National Wild and Scenic River designation.

Along the North Fork, the stream center delineates the agency boundaries. Along the Middle Fork, the northern stream bank delineates the agency boundaries. Substantial portions of the west bank of the North Fork are privately owned. Flathead National Forest administers the land west of the National Park, and is by legislation the agency with primary responsibility for administering the Flathead NWSR system.

River float trips on these waters have become extremely popular in recent years. With National Wild and Scenic River designation, it is expected that recreational use of the rivers will increase, particularly river float activity.

Glacier National Park and Flathead National Forest are collaborating in the management of the Middle and North Fork waters. Collaboration recognizes the need for uniformity in administering the Flathead National Wild and Scenic River System. Glacier National Park recognizes U. S. Forest Service leadership in administering the Flathead NWSR system, and all parties recognize Glacier National Park interests in asserting standards of resource management and visitor protection.

A formal Memorandum of Understanding asserting common interests and inter-agency cooperation, as specified in an Interim Management Plan, is in preparation.

Until more is known about use levels and the susceptibility of riparian resources to recreational impact, the rivers are being managed in accordance with the Flathead River Wild and Scenic River Management Plan of 1980. This document was prepared by the Flathead National Forest in consultation with Glacier National Park and other interested agencies.

This management plan classifies the Middle Fork below Bear Creek and the North Fork below Camas Bridge as Recreation Rivers. The North Fork above Camas Bridge is classified as a Scenic River. Recreation classification attempts to provide users with a diversity of river-related activities, including motorized boating up to 10 h.p., and group sizes of commercial parties up to 15 people. Scenic classification attempts to provide users with a high quality recreational experience with particular stress on scenic qualities and few encounters with other floaters. Motorized boats are not allowed, except for search and rescue purposes, and commercial parties are limited to ten people.

Prior to each season, limits are established on the number of commercial permittees allowed to operate on each segment of the rivers.

Numbers of non-commercial floaters will not be limited, pending the gathering of reliable data.

Glacier National Park and Flathead National Forest personnel jointly and individually patrol the rivers, contact users, and gather data on use and impact. Data is synthesized and summarized for management review.

The imposition of limits on numbers of commercial permittee outfitters and their clients asserts the initial element of agency control on numbers of users. It will also establish a crude baseline from which to monitor trends in both recreational use and in impact on riparian resources. Collaboration in planning and management of the rivers with the Flathead National Forest will provide uniformity in administration, which will enhance exchange of information and avoid complicating use rules for recreationists.

Patrols, visitor contact, and data gathering will provide a much-needed point of reference upon which to monitor trends and refine policy.

3. Alternative Actions and Their Probable Impacts.

A. No Program. Allow unlimited recreational use of the North and Middle Forks. Make no attempt to contact users or impose standards. It would be possible to gather data on use and impact, but it would be more difficult to impose limits on use in the future if this becomes necessary. Failing to set standards might result in unintended and undetected impact on resources which would require eventual rehabilitation.

B. Establish limits and standards of administration independent of the U. S. Forest Service. This would result in lower limits of use and lower tolerance for impact on resouces on National Park lands, but it would complicate use of the river for visitors and increase the administrative burden for both agencies. Managing the river independently would subvert the requirements of the National Wild and Scenic River Act.

C. No Action. Continue to coordinate closely with managers of the Flathead National Forest with the primary objective of achieving uniformity in the administration of the entire system. Maintain high standards of resource management, and apply minimal limitations on recreationists within the confines of use permits and a designated-site camp system.

Achieving uniformity of operations between two public agencies, which have somewhat diverse purposes, yet common objectives of service to river recreationists, may require some compromise.

4. Recommended Course of Action. The recommended course of action is Alternative C. We will continue to work closely with managers of the Flathead National Forest to achieve uniformity in the administration of the entire system, and we will continue to maintain a high standard of resource management. During 1983, we will develop a Memorandum of Understanding with the Flathead National Forest.

a. Resource Management. Continue to manage the resources along the river to enhance those qualities which made them eligible for National Wild and Scenic River designation.

b. Monitoring. Continue to monitor use and activities, and use this information in protecting the river resources.

c. Research. Continue research, studying effects of river use on the resources.

Commitment to Accomplishments:

FY 1983. Manage rivers to protect National Wild and Scenic River qualities. Continue monitoring use.

FY 1984. Manage rivers to protect National Wild and Scenic River qualities. Continue monitoring use.

FY 1985. Manage rivers to protect National Wild and Scenic River qualities. Continue monitoring use.

FY 1986. Manage rivers to protect National Wild and Scenic River qualities. Continue monitoring use.

FY 1987. Manage rivers to protect National Wild and Scenic River qualities. Continue monitoring use.

1. GLAC-N-012 EXOTIC PLANT Management

2. Statement of Problem. The presence of exotic plants is a problem in the maintenance of native plant communities and therefore the control of exotics is of primary importance. The elimination of exotic species is a formidable, if not impossible, task. Most exotic species inhabit disturbed areas such as roadside, borrow pits, residential lawns, recently burned areas, horse pastures, campgrounds, abandoned homesites, powerline clearings, and maintenance and utility areas. Exotic plants became established in Glacier National Park when western man began populating the area toward the end of the nineteenth century.

Their introduction into the area came mainly from:

a. Horse and other livestock feed.

b. Mud and snow dropping off automobiles.

c. Seeds blowing off railroad cars.

d. Topsoil, seed and sod brought in for landscaping purposes.

Exotics such as dandelion, Kentucky bluegrass, common timothy, butter-and-eggs, spotted knapweed and Canada thistle also invade undisturbed native plant communities.

Besides those mentioned, other common exotic species are leafy spurge, St. Johnswort, plantain, yellow and white sweetclover, white and red clover and common mullein.

The species of plants in Glacier National Park which need to be controlled are (Centaurea maculosa) spotted knapweed, (Hypericum perforatum) St. Johnswort, (Euphorbia esula) leafy spurge, and (Cirsium arvense) Canada thistle.

Current Management Action includes:

Spotted Knapweed. This exotic is found on both sides of the park but more commonly east of the Continental Divide although roadside populations have been reported near McDonald Lodge and Camas and Apgar Roads west of the Divide. Current action has been one of monitoring locations and spread.

St. Johnswort. In the past, efforts to control this exotic have been made in remote and inaccessible areas of the park. Present action is restricted to monitoring locations and spread.

Leafy spurge. Control actions relative to this plant have in the past been confined to pulling in an attempt to eliminate the species and mowing to contain its spread. An experimental burning program had been instituted to measure the effects of fire as a control agent. Mowing was attempted, but was stopped because there were indications the mowing caused leafy spurge to spread.

Canada thistle. Monitoring of the location and spread of this plant is the current action.

Results of Current Action:

Spotted Knapweed. Current management action has not resulted in the elimination of spotted knapweed. The available data indicate that this exotic is slowly spreading into disturbed areas within the park. Therefore, control is not a reality. Escape into native vegetation heavily utilized by wintering elk on Two Dog Flats is being monitored.

St. Johnswort. No reduction in the amount or spread of St. Johnswort is indicated.

Leafy spurge. The efforts toward control through pulling and mowing have not reduced the area covered by this plant, and it is still too early to assess the effects of burning on the control of leafy spurge.

Canada thistle. Canada thistle is quite widespread in the park and present actions do not control its spread. This plant has a tendency to encroach on undisturbed areas.

3. Alternative Actions and Their Probable Impacts.

a. No Program. Do not attempt to document, control or eliminate exotic plants. Allow exotics to grow and spread to any location in the park. Native plant communities would be reduced in areas of exotic infiltration. This will lead to unnatural changes in the ecosystem.

b. No Action. Continue present action. The present management action only serves to document the presence of all the exotics, not to control or eliminate them. Without control or elimination, a reservoir is maintained which can only serve as a source to spread these weeds. The results of man's actions (construction and maintenance) leave disturbed areas open for the encroachment and spread of these exotics. The adjacent roadside outside the park harbor a vast quantity of exotic plant seed for reintroduction into the park.

Mowing only serves to hide the presence of exotics and enhances their chance of survival by retarding the growth of native species. Pulling or tilling the soil is not effective and again leaves a disturbed area which is a prime condition for the establishment of exotics. The continuance of current actions is an ineffective alternative. As previously stated, the effects of burning have not been assessed and burning is only applicable to restricted areas.

c. Establish herbicide program. A program of herbicide spraying could be introduced into Glacier National Park. While a program of this kind, if expertly applied, might be an effective control, it would require recurring treatments. In a natural area where maintenance of native species is paramount, a program of herbicide spraying may have a detrimental effect on native as well as exotic species. Prior to any chemical application, test plots would be utilized and careful monitoring of effects will be noted.

d. Program of biocontrol. Natural predators, screened by the USDA, are being used to control exotic plant species in the United States. Under such a regime, a host-specific insect is used to control a given exotic plant. Such insects either interrupt the reproductive process, resulting in no seed production, or weaken the plant to the point where vegetative growth and/or seed production are very low. While elimination of the exotic is usually not achieved, equilibrium results in the exotic being confined to small areas. Over time, such a program could result in elimination by giving native species a better chance to compete with and overcome the advantages inherent in exotic species.

4. Recommended Course of Action. Biocontrol is a method which has proven effective in the control of exotic species of plants and is now being used extensively in the State of Montana. Here, outstanding success has been achieved in checking and controlling the spread and reducing the area covered by musk thistle (Carduus nutans). Other control methods may also be desirable in specific situations. State and county officials have introduced the gall fly to control spotted knapweed adjacent to the park. The success of this program will be monitored. Initially, the biocontrol agent should be introduced and studied under controlled conditions. This serves to test the effectiveness of the insect against the local exotic to determine the ability of the insect to adapt to local conditions and to rear a population to inaugurate a more extensive biocontrol program.

A. Resource Management: Explore most effective biocontrol methods being used and how they may be adapted to Glacier National Park.

B. Monitoring: Continue inventory of exotic plants.

C. Research: Conduct research on burning leafy spurge and review state of the art for control method relating to exotic weeds.

Commitment to Accomplishments

FY 1983 - Continue to inventory exotic plant populations and determine the feasibility of using biocontrol methods to control exotic plants.

FY 1984 - Same as FY 1983

FY 1985 - Same as FY 1983

FY 1986 - Same as FY 1983

FY 1987 - Same as FY 1983

1. GLAC-N-013 BALD EAGLE Management

2. Statement of Problem. Glacier National Park attracts a large concentration of bald eagles each fall and designation of the bald eagle as an "endangered" species has added a dimension of urgency to the proper management of this bird.

An unusally rich combination of plants and animals occupy the flood plain formed by McDonald Creek. Introductions of kokanee salmon into the upper Flathead River system during the early 1920's established a spawning cycle in lower McDonald Creek, which subsequently attracted a substantial number of bald eagles. This has become the primary autumn season attraction of Glacier National Park and perhaps of northwestern Montana.

The contiguous flood plains of lower McDonald Creek and the Middle Fork of the Flathead River have been rather intensively developed for settlement, transportation, communication, and recreation beginning the early part of the Century. Development has continued to the present, with few formal constraints. Encroachments on the flood plain in the form of roads, buildings, power and utility lines, garbage dumps, sewage disposal facilities, foot paths, etc., have substantially reduced the habitable portion of the area for wildlife and have made most of it easily accessible to humans. These activities have probably altered native wildlife populations, displacing some species, forcing habituation to human activities, and attracting species that readily adapt to human settlement.

The area receives year-round human use, although use is most intensive during the summer and autumn recreation seasons, from April to November. Summer activity consists mainly of hiking, boating, bicycling, driving, fishing, horseback riding, and other leisure pursuits typical for an area containing a wide assortment of recreational opportunities. Autumn activity consists primarily of viewing bald eagles, which arrive in substantial numbers usually by mid-October. There is a self-guiding ski trail in the area during the winter. The most visible problems associated with the two to three month viewing season are: congestion during certain times at the designated viewing site, and occasional disturbances of eagles and waterfowl by people entering areas along the Creek. These areas are closed to human entry. There is also potential for grizzly bear/human conflict when bears frequent the Creek to feed on salmon.

The bald eagles, which visit the McDonald Creek and Flathead River areas represent perhaps 8% of the total number of the northern subspecies that winter in the conterminous United States. We must learn more about its range, dispersal, patterns of migration, relationship to habitatand to other species and human and other ecological factors, in order to formulate sound management programs. The species must be protected by providing a suitable and undisturbed habitat. Glacier National Park is eminently suited to fulfill an important Continental function in not only protecting the visiting eagles, but also in educating people through interpretation about the significance of this bird and the necessity of its survival.

The kokanee salmon is a non-native fish, and its presence in national park waters is inconsistent with national park objectives of naturalness. However, concern for the presence of non-native species, such as kokanee salmon, must be balanced with concern for interaction with other species, such as the bald eagle. The abundant and early accessible food source may increase survival of juvenile eagles during their first winter. The spawning run may also offset historic feeding opportunities lost long ago by increasing dams, and the loss of bison.

Although a congregation of any species subjects a large number of animals to the possibility of increased loss through density dependent threats, the bald eagle gathering at a concentrated food source is a behavior typical of the species. The Glacier concentration is unnatural only in terms of location. However, bald eagles must be viewed as components of continental biota and management should focus on long-term preservation of this migrating species. Management actions have the potential to impact bald eagle populations throughout the northwestern United States. Cooperative efforts are needed to offset internal and external threats that include disturbance, interference with the food chain, integrity and duration of salmon availability and environmental contamination.

Current management strategy includes restriction of human access to the Creek area, while eagles are present in order to minimize disturbance. Interpretation, research, and public information activities are also undertaken during this period.

Access to McDonald Creek for eagle viewing is limited to two points: The Apgar Bridge, and a small observation blind on the Creek bank about 1/2 km south of the Apgar Bridge. People are not allowed to park their cars on or near the bridge. Parking is provided at Apgar Village, with access to the viewing area by a foot path near the Visitor Center. People are allowed access to the observation blind on formal interpretive guided trips. Visitor and school groups are the main users. Access to the blind is via the foot path beginning at the Apgar Bridge, a route of about 1/2 km.

The area closed to public access is posted with 25 cm x 35 cm temporary signs which state: "To avoid disturbing the bald eagles, this area is closed. Please use viewing area at Apgar Bridge." Since grizzly bears are occasionally seen along the Creek, a special sign is posted when grizzly bears are nearby, which reiterates the closure.

Interpretation of the eagle phenomenon emphasizes the relationship between kokanee salmon and the eagle concentration. The substance of the interpretive material draws heavily from results of research currently being conducted. The primary visitor contact point is intended to be the Information Station at Apgar Village, where a six-minute automatic slide and sound program is available, as well as a brochure, small exhibits, and a staff person. An Interpreter is stationed at the Apgar Bridge viewing point to primarily interpret and control access to closed areas.

Research on this eagle concentration began with the historical, inventory, and behavioral work of McClelland and Shea several years ago. From 1965 to present weekly counts of eagles have been made according to the method described by McClelland in his papers. In 1977, scientists began marking eagles, in order to learn more about the range and disperals of the birds. During the period 1977-1981, 190 eagles were marked.

The annual eagle concentration arouses much interest. Local and regional news media report the event. An attempt is made to channel all pertinent information through the Assistant Superintendent's office, in order to simplify matters for the media and to maintain consistency. This has proven to be particularly important for reporting changes in regulations, road conditions, and closures, census data, and eagle arrivals and departures.

Restricted access to the McDonald Creek area has undoubtedly minimized disturbances to eagles. The system of a general area closure with designated viewing places seems to be a satisfactory arrangement for both managers and viewers, though eagles are occasionally disturbed by aberrant visitor and Park employees.

Current management is confined to keeping viewers and eagles separated. It does not address comprehensive habitat solutions to protect eagle territory. The lower McDonald flood plain is a fragile environment requiring comprehensive management. Conflict is apparent in attempts to manage a quite limited space over which land managers, recreationists and wildlife are competing.

Specific Points of Concern Include:

1. Existing and Future Development. The flood plain presently contains developments that include sewage plant, two barns and corrals, pasture/spray field, old incinerator, rock crusher, storage piles, boneyard and scrap pile. A management perspective is needed to define priorities for use of the area. The flood plain is an ecosystem of diverse communities shared with endangered and threatened species and other wildlife. It may be viewed as inappropriate to expand development on the flood plain, but in fact revise or relocate existing activities based on a ten-year perspective.

2. Observation Blind. The use of this structure has been controversial since it was made available to the public in 1972. People associated the blind with the best viewing area, and entered the closed are in search of the blind or left the bridge viewpoint for the blind without permission. Also users of the blind tended to be loud and visible and walk along the creek. As a result use of the blind was restricted on a 'first-come, first-served' basis, accompanied by Rangers or Interpreters on scheduled trips. Viewing quality at the blind the last several seasons has decreased, because the oxbow is being cutoff. Little spawning occurs and thus there is little feeding by eagles.

3. Designated Viewing Place. The annual eagle concentration attracts many people to the viewing area at Apgar Bridge. The diversion of traffic through Apgar and elimination of parking at the bridge has resulted in noted improvement in viewing quality. The Quarter Circle Bridge was discontinued as a viewing area, due to grizzly bear use of the area, potential hazard of walking to the bridge from the parking area, and disturbance up the creek from people walking into the closed area. Also a seasonal closure based on eagles and bears eliminates the need to trap and remove bears.

4. Salmon Snagging and Fishery. The annual kokanee salmon run attracts hundreds of fishermen, who are allowed to fish State waters. The fishermen gather in large informal groups near the confluence of lower McDonald Creek and the Middle Fork and downstream a few hundred meters, and in selected places beyond.

A decrease in the number of kokanee salmon spawning in lower McDonald Creek has resulted in more competition among the eagles for food. As a result, the number of days eagles remain at the Creek to feed (eagle use days) has been decreasing. If food isn't available the eagles move on. The State Fish, Game and Parks Department is studying the kokanee population in the Flathead Drainage, and will make their findings public in 1983.

In autumn 1981, bald eagles were captured, banded, blood sampled and selectively marked and equipped with radio-transmitter packages. Winter location, spring

migration routes and summering areas of transmitter-equipped eagles were identified. Monitoring and tracking during 1982-1983 period will conclude the current phase of movement study. (Crenshaw 1982).

3. Alternative Actions and Their Probable Impacts.

A. No Program. Assume that eagles will ultimately habituate to human intrusion in their feeding and perching territory and that people will make their own adjustments to crowding and traffic developments. This can be rationalized in part by noting that eagle concentrations here are attracted to introduced kokanee salmon, hence the birds are unnaturally abundant and don't warrant special protection by the National Park Service. Since eagles are under human pressure in other parts of their continental range, the National Park Service shouldn't feel obligated to provide a haven for a part of their annual migration, as this may actually delay the eagles' inevitable accommodation to human occupancy of their habitat.

The impact of this rationale would, in all probability, render the McDonald Creek stop-over uninhabitable for migrating eagles. Eagle concentrations may cease to occur. Opportunities for people to observe bald eagles in their natural setting at close range would no longer exist, opportunities for further scientific research on eagles would diminish, and northern bald eagles would lose yet another sanctuary during their southward movement and would thus be closer to extinction.

The rationale this Alternative ignores is the legal considerations now mandated by the February 1978 inclusion of the bald eagle on the list of endangered species.

B. Manage the Area in a Manner That Does not Promote Habitat Improvement. Keep the McDonald Creek vicinity closed to human access, except at the two bridges and the observation blind. Schedule the blind with emphasis on educational activities. Interpretive activities at the Apgar Bridge, the Information Center, and at the Quarter Circle Bridge will be available as staffing permits. Tolerate vehicle traffic problems at the Apgar Bridge viewpoint. Make refinements in signing and parking.

The impact of this degree of management activity would probably result in continued protection of eagles during most of their stop-over, providing disturbances do not occur more frequently than they do at present. It is generally agreed that staff and access control have been less than adequate to handle visitor needs and protection of eagles during the periods of heaviest visitation.

This type of management doesn't stimulate action to rid the flood plain of unneeded structures and facilities, or make other habitat improvements, nor does it protect the area from future developments, which would make it less suitable for eagles or for viewing.

C. Intensify Management Activity. Begin habitat improvement and protection. Protect and enhance the flood plains of McDonald Creek and contiguous areas of the Middle Fork. Provide improved viewing opportunities of bald eagles and associated species. Interpret the flood plain habitat more intensively. Support scientific research of bald eagles.

Establish formal guidelines for restricting future development of the McDonald Creek and contiguous Middle Fork flood plain. Anticipate that these areas will be designated as critical seasonal eagle habitat.

Designate the bald eagle managment area as that area of McDonald Creek and vicinity within view of perching, feeding, or roosting bald eagles. It extends from Rocky Point on the east shore of Lake McDonald to the Middle Fork, and downstream along the Middle Fork north shore about 1 km below the confluence of McDonald Creek. It includes the entire west shore of McDonald Creek between the Apgar and Quarter Circle Bridges and the area of the east shore between the creek and the bicycle-foot path, the creek and the overhead power lines, the creek and the sewage settling pond, and the creek and the maintenance access road.

The impact resulting from implementation of Alternative C would be withdrawal from the flood plain of unessential human materials and activities, and the enhancement of viewing opportunities at the two bridge sites.

Implementing this Alternative would result in some costs to remove and relocate materials, and rehabilitate sites, and it would require minor adjustments in certain maintenance activities. It would result in a major change in usual visitor traffic flow patterns in the Apgar Village area, with a probability of some public comment about inconvenience. The benefit realized in reducing vehicular traffic across the Apgar Bridge would likely override this criticism.

Continuing support of research projects will expand knowledge in areas of great importance concerning bald eagles generally and specifically concerning the members of this concentration and the value of management programs, which we think are protecting this unique resource.

4. Recommended Course of Action. Alternative C is recommended as proper application of management. Intensify management activity. Begin habitat improvement and protection. Management will be phased in over a ten year period.

Protect and enhance the flood plains of McDonald Creek and contiguous areas of the Middle Fork through area closures and critical habitat designation. Provide quality viewing opportunities of bald eagles and associated species at Apgar Bridge and the eagle blind. Continue traffic diversion through Apgar and no parking at the bridge. Interpret the flood plain habitat more intensively.

Establish formal guidelines for restricting future development of the McDonald Creek and contiguous Middle Fork flood plain. Anticipate that these areas will be designated as critical seasonal eagle habitat.

Designate the bald eagle management areas as that area of McDonald Creek and vicinit within view of perching, feeding, or roosting bald eagles. It extends from Rocky Point on the east shore of Lake McDonald to the Middle Fork, and downstream along the Middle Fork north shore about 1 km below the confluence of McDonald Creek. It includes the entire west shore of McDonald Creek between Apgar and Quarter Circle Bridges, and the area of the creek and the main road. This area is delineated on the accompanying map.

The impact resulting from Alternative C is a management perspective that establishes priorities of use for the lower McDonald Creek flood plain, and establishes the value of management in protecting threatened and endangered species.

Implementing this alternative may eventually result in modification of present use patterns, relocation of materials and facilities, and rehabilitation of sites. It results in modified traffic flow through Apgar Village and restricted use of lower McDonald Creek. It provides support for research projects, which expand knowledge of bald eagles.

A. Resource Management: Protect the habitat of wildlife including endangered and threatened species; prevent disturbance from exterior sources and provide an opportunity for viewing ecological processes with minimal disturbances.

B. Monitoring: Continue eagle counting and marking, in order to learn more about range and dispersal of birds.

C. Research: Continue to collect and analyze data on eagle range, habitat, and dispersal.

Commitment to Accomplishments:

FY 1983. Protect bald eagles and enhance stop-over area. Allow for quality viewing by public.

FY 1984. Protect bald eagles and enhance stop-over area. Allow for quality viewing by the public.

FY 1985. Protect bald eagles and enhance stop-over area. Allow for quality viewing by the public.

FY 1986 Protect bald eagles and enhance stop-over area. Allow for quality viewing by the public.

FY 1987 Protect bald eagles and enhance stop-over area . Allow for quality viewing by the public.

1. GLAC-N-014 MOUNTAIN GOAT Management

A. Gunsight Pass-Sperry Glacier

2. Statement of Problem. Gunsight Pass-Sperry Glacier is an alpine area in the central part of Glacier National Park. The area is traversed by a trail leading from Lake McDonald on the west to St. Mary on the east. There are backcountry campgrounds at Gunsight Pass, Gunsight Lake, Sperry Chalet and Lake Ellen Wilson. Overnight accommodations are also available at Sperry Chalet. The area is one of the most heavily visited backcountry areas of the Park. A popular attraction of the area is the mountain goat (Oreumnos Americanus).

Mountain goats occur naturally in the area of Gunsight Pass-Sperry Glacier, but were attracted to the trail and Chalet by direct salting in the Park's early years. The area is frequented by 55 to 65 goats during the summer months (Bansner 1976). The Park has an estimated 1500 goats (Chadwick 1976). Although the Park has stopped direct salting and greatly reduced blasting for snow removal, goats are still attracted by human and horse urine, and perspiration on packs and clothing (Bansner 1976).

A research study during the summers of 1975 and 1976 documented human-goat interactions in the Gunsight-Sperry areas. The study indicated that an artificial situation had been created with danger to humans from butting or goring. The study recommended that management be directed at reducing close range interactions between visitors and mountain goats.

Goats are habituated to people. It does not appear that attractants have changed mountain goat group size (Bansner 1976). Goats searching for salt tend to stray farther from escape areas, and may be more susceptible to predators. Close range human-goat interactions present a potential threat to humans. Reduction in blasting for trail work has reduced the amount of salt available, as an attractant, but increased the cost of trail work.

3. Alternative Actions and Their Probable Impacts.

a. No Program. Allow human-goat interactions to occur due to salting. This leads to an unnatural concentration of goats in the area, and increased human-goat conflicts.

b. No Action. Continuation of the present situation presents an opportunity for human injury by goats. The present situation does not provide for adequate information, enforcement, or sanitation facilities.

c. Removal of Goats. Live trapping would be extremely difficult and costly, due to the terrain and location. Removal of animals through direct reduction is not recommended, since goats are native to the area and are a popular resource.

d. Closure of the area to people. This would remove the unnatural sources of salt, and goats would eventually return to a natural state. The area is one of the most popular in the Park, and is served by a concession facility.

e. Reduce attractants and better inform visitors, through the following measures:

(1) Improved enforcement against salting. This will reduce direct salting by photographers and other visitors. Efforts have been generally unsuccessful in the past, due to inadequate manpower, so additional staffing will be needed.

(2) Improve sanitation. Strategically located outhouses along main trails would reduce human urine as an attractant. This will require additional structures in a proposed wilderness area, and more manpower will be required for cleaning and maintenance of these facilities.

(3) Information-interpretation. Information panels, similar to existing panels at Jackson Trailhead, could be installed to explain mountain goat ecology at trailheads and Sperry Chalet. Similar information could be included in Naturalist talks at Sperry. Hikers would be informed of locations of outhouses, if these were located along trails.

(4) Monitoring and reporting system. Resource Management and Research personnel would set up a system for monitoring human-goat interactions and attempts to reduce these contacts.

4. Recommended Course of Action. Alternative d. reduce attractants and better inform visitors is recommended. This alternative will reduce goat-human conflicts and reduce the unnatural concentration of goats in the area.

a. Resource Management. Enforce laws which prohibit direct salting and provide adequate information-interpretation of mountain goat ecology.

b. Monitoring. Continue to monitor numbers, locations, habitat, and movement of sheep in the area.

c. Research. No program planned in near future.

Commitment to Accomplishments:

FY 1983. Improve enforcement, sanitation, and information/interpretation concerning the artificial situation with the goats.

FY 1984. Improve enforcement, sanitation, and information/interpretation concerning the artifical situation with the goats.

FY 1985. Improve enforcement, sanitation, and information/interpretation concerning the artifical situation with the goats.

FY 1986. Improve enforcement, sanitation, and information/interpretation concerning the artifical situation with the goats.

FY 1987. Improve enforcement, sanitation, and information/interpreation concerning the artifical situation with the goats.

1. GLAC-014 MOUNTAIN GOAT Management

B. Walton Mineral Lick Area

2. Statement of Problem. The Walton Mineral Lick draws a large number of mountain goats to an area which the goats can only reach by crossing or going under U.S. Highway 2 or the Middle Fork of the Flathead River.

The Walton Mineral Lick is an exposure of the Roosevelt Fault which parallels the Middle Fork of the Flathead River. It is located along the southwest boundary of the park and is a popular visitor attraction. It is estimated that at least 200 goats visit the lick during each season, the majority coming from the Running Rabbit area. A few from Flathead National Forest cross the river to reach the lick. Peak use of the lick occurs in late June and early July.

Prior to 1980, goats had to cross U.S. Highway 2 or walk under the Snow Slide Gulch, Highway 2 bridge, to get to the lick. There were two visitor parking areas along U.S. Highway 2. An interpretive sign was located at the viewing area along the highway and visitor congestion was a real problem at this location.

During the summers of 1980 and 1981, the 3.2 mile section of Highway 2 was rebuilt. Construction included a goat underpass, a new Snow Slide Gulch highway bridge (the old bridge was removed by an avalanche in February, 1979), wing fences to funnel goats to the goat underpass and a new U.S. Highway 2 bridge, plus a new visitor viewing area below U.S. Highway 2 southwest of the two original viewing areas.

The new goat viewing area has an interpretive sign, garbage can and vault type restroom. The new highway through the park was widened, curves straightened, and highway grades reduced.

The 1980 and 1981 construction season had goat monitors from research to observe goat crossings, construction effects on the goats, etc. Unfortunately, their report has not been finalized to date.

During the 1983 and 1984 season, the Federal Highway Administration has provided $22,000 to the University of Idaho for a researcher to study visitor use and goat activity at the new facility. This should provide data to follow up the construction project.

Last summer there was still traffic congestion along the new highway at the old viewing location. No parking signs were erected near the end of the season. Visitors hike below the goat underpass and disturb the goats on the lick. A person fell in the gully below the new viewpoint and was injured. The main problem is people management, not goat management.

The new viewpoint offers good access for poachers on the USFS lick; however, there was nothing found to indicate any poaching activity over the past season.

River use is increasing which causes more disturbance of goats on the lick. When rafters pass goats on the lick, the goats normally climb higher on the lick but do not leave it.

The present management of the area is done by personnel stationed at Walton Ranger Station. Each day the viewpoint restrooms are cleaned, garbage is removed from the area, and the viewpoint area is checked. During the rafting season, raft patrols float past the Lick at least once a week. Law enforcement patrols go through the area at random times. The goat wing fences are checked and maintained annually. The main causes of goat mortality with the present management are 1) drowning in the Middle Fork of the Flathead River during high water, 2) falls off lick, and 3) natural predation (coyotes).

At this time goats shy away from visitors.

3. Alternative Actions and Their Probable Impacts

A. No Program. This would allow natural behavior among the goat population. However, poaching and human disturbance may increase. Restrooms and garbage can would be removed. Litter could become a problem at the viewpoint. Visitors would complain about unmaintained facility. Possibly close viewpoint.

B. Continue present management action. This will allow natural behavior among the goat population. Visitors will be able to use the new viewpoint facility and law enforcement patrols will continue.

C. Continue present management action, but more effectively sign Highway 2 viewpoint areas with "No Parking" signs and have small barricades during peak goat use to prevent parking on road shoulder of eastbound lane. Also, erect signs below Highway 2 leading to the Lick closing the area to visitor use, due to goat disturbance caused by visitors above the Lick. This will allow natural behavior among the goat population with less human disturbances at the Lick. Potential safety hazards along Highway 2 would be reduced by prohibiting the parking at the old Highway viewpoints.

Work with the U. S. Forest Service to construct information signs at launch site at Bear Creek to inform rafters of the Goat Lick and ask their cooperation in not disturbing the goats while they float by, don't stop under the Lick, etc.

4. Recommended Course of Action. Alternative C is the recommended course of action. This Alternative includes education of the visitor through the interpretive sign at the Goat Lick, and river runners at the launch site at Bear Creek; it provides for less disturbance of the goats on the Lick by visitors, and provides for reduction of potential visitor safety hazards along Highway 2. The goats would remain in their natural behavior pattern, while visiting the Lick.

a. Resource Management: Walton Subdistrict Ranger and staff will take counts of goats frequenting both the U. S. Forest Service and National Park Service Licks at Walton. They will monitor visitor use in the area, and note trends which could alter the natural behavior of the goats using the Lick. Special emphasis will be visitor use at the new viewpoint and underpass.

b. Monitoring. During the 1983 and 1984 summer seasons a University of Idaho researcher will monitor visitor and goat activity in the area.

c. Research: Will work closely with monitoring program above.

Commitment to Accomplishments:

FY 1983 Support University of Idaho research efforts. Monitor goat and visitor use. Maintain viewing area.

FY 1984. Support University of Idaho research efforts. Monitor goat and visitor use. Maintain viewing area.

FY 1985: Monitor goat and visitor use. Maintain viewing area. Analyze data from University of Idaho research.

FY 1986: Monitor goat and visitor use. Maintain viewing area. Analyze data from University of Idaho research.

FY 1987: Monitor goat and visitor use. Maintain viewing area. Analyze data from University of Idaho research.

1. GLAC-N-015 WINTER USE Management

2. Statement of Problem. Increased winter use has led to the need for increased winter use management. Although about 80% of Glacier's visitation occurs during the three summer months, winter use of the park is gradually increasing. Winter activity centers around snowshoeing and cross-country skiing. Key attractions are photography, wildlife viewing and enjoyment of the winter landscape. The number of persons registering for ski and snowshoe trips into the park has increased from 877 in 1972-73 to 6607 in 1982. Most winter use occurs as day trips along designated routes. Hazards from avalanches and sudden weather extremes discourage most overnight or extended backcountry trips.

Following public hearings and completion of an environmental assessment in late 1975, use of park roads by oversnow machines was prohibited. This policy is reviewed annually. Ample opportunities for mechanized oversnow travel are available on public lands adjacent to the park. Approximately 10 miles of road along Lake McDonald are plowed during the winter to allow enjoyment of the winter scenery from a vehicle and to provide access to popular McDonald Valley ski and snowshoe trails.

Information on winter use is available to visitors in copies of the Glacier Times and other literature. Over a dozen suggested trips are detailed in the Glacier Times; they range from short, easy trips for the novice to long, overnight challenges for the hardy expert. Trails marked for winter use are available along the western, southern and eastern sides of the park.

Short, conducted ski trips are offered by naturalists in the Lake McDonald area at intervals during the winter.

Guided ski trips into the park and equipment rentals are available at the Izaak Walton Inn at Essex on the park's southern boundary.

Winter camping is available at St. Mary and Apgar. Permits are required for overnight stays elsewhere in the park during the winter. Due to the hazards involved, extended winter expeditions into the backcountry are discouraged.

The Going-to-the-Sun Road is plowed from the park entrance at West Glacier to the head of Lake McDonald and allows viewing of winter scenery by persons who prefer to enjoy the park from their vehicle. This road also provides access to popular McDonald Valley ski trails. The designation of ski trails in the lower valleys and the efforts to discourage cross-country skiing at higher elevations provides areas for the use of visitors seeking the peace and solitude of the natural world in winter while protecting unknowing visitors from the hazards of unpredictable avalanches. Current action helps to protect wintering wildlife by eliminating most mechanized winter travel. The St. Mary-Two Dog Flats area is intensively used by 200-300 wintering elk. The Many Glacier area is winter range for about 100 Bighorn sheep. These areas are bisected by unplowed roadways and would be highly impacted by snowmobile use.

3. Alternative Actions and Their Probable Impacts.

   a. No Action. Permit use of unplowed roads by oversnow vehicles. This activity was permitted prior to 1975 and was discontinued as a result of public input and a management review. A detailed analysis of alternatives is provided in an environmental assessment prepared on September 18, 1975.

b. Continue Present Action. Seek alternatives to provide visitors with additional winter recreation opportunities. This will allow continued use and enjoyment of the park in winter by a variety of visitors seeking quiet and solitude. It should provide reasonable protection for wintering wildlife and other park resources. The popularity of ski touring will probably result in increased park winter use. Alternatives may include items such as limited trail grooming and additional naturalist led ski tours.

The policy of not designating snowmobile or other motorized vehicle routes preserves the defacto wilderness character of Glacier in winter and preserves a rare natural resource, i.e., a quiet, natural atmosphere.

c. Maintain Additional Routes for Winter Vehicle Travel. Plowing of additional miles of roadway would permit viewing of additional winter scenery from vehicles. This could only be accomplished with a considerable increase in monetary expenses, would consume additional fuel, and require additional manpower for plowing and patrolling the roads. Since park roads generally follow valley floors which are important winter range for wildlife, this alternative could be expected to have an adverse effect on some wildlife species. A panorama of spectacular Glacier winter mountain scenery can be viewed from U.S. Highway 2 on the south boundary of the park and from U.S. Highway 89 on the east boundary.

d. Close the Park to All Winter Use. This alternative would reduce any existing impact of human use on wildlife and other park resources. It would not, however, provide for the public enjoyment of the park with its tranquil atmosphere in the winter.

4. Recommended Course of Action. It is recommended that we proceed with alternative b. This policy is reviewed on a yearly basis.

A. Resource Management: Continue to review the snowmobile policy at Glacier National Park on a yearly basis. Post and advise on avalanche danger in the park.

B. Monitoring: Monitor effects of winter use on wildlife. Monitor avalanche activity.

C. Research. Effects of current management action on wildlife and vegetation should be conducted.

Commitment to Accomplishments

FY 1983 - Review policy on yearly basis and continue to monitor effects.

FY 1984 - Same as FY 1983

FY 1985 - Same as FY 1983

FY 1986 - Same as FY 1983

FY 1987 - Same as FY 1983

1. GLAC-N-016 BIGHORN Sheep

2. Statement of Problem. In recent years, natural reaction to humans and vehicles has been modified, and problems have arisen with "roadside beggars" among Bighorn sheep in the Many Glacier area. Bighorn sheep (Ovis canadensis) are native to Glacier National Park. Their distribution appears to be limited primarily to the areas along and east of the Continental Divide, due to the lack of suitable winter range. Data on populations and distribution are rather sketchy, but Bighorn sheep are known to occur in the Two Medicine and Many Glacier areas.

The Many Glacier Valley was developed for visitor use during the earliest years of the park, and currently includes a campground, store, cabin area, large hotel and support facilities. Artificial feeding of Bighorn sheep during the winter months was conducted between 1920 and 1938. Population counts during that period varied from a high of 134 sheep in 1925 to a low of 17 in 1937. The wide fluctuations resulted primarily from periodic decimation from lungworms.

A 1939 study, noted that sheep showed "some degree of uneasiness when approached by humans on foot", and when on the road "showed considerable uneasiness and moved past automobiles in a skittish fashion."

Recently the feeding of Bighorn sheep has become popular with some visitors; such behavior has an adverse impact on the animals. As they become more accustomed to human contact, the sheep are susceptible to illegal hunting and to injury from vehicles along roadways. Their health may suffer from the food provided by humans.

Studies of Bighorn sheep in other areas indicate that the animals normally move in summer to higher elevation, better quality range. These studies suggested that this summer migration is important in determining individual vigor and population. Thus, it is possible that the roadside feeding helps maintain an "artificial" summer population in the vicinity of the road, to the detriment of the herd. Finally, the roadside feeding offers potential hazards to visitors as a result of traffic congestion, the possibility of collisions with animals on the road, and possible injury from the animals themselves.

Bighorn sheep are protected along with other park wildlife from hunting, feeding and other disturbances by the Code of Federal Regulations (36 CFR 2.32). Current National Park Service "Management Policy" for native animal populations is to "...strive to maintain the natural abundance, behavior, diversity and ecological integrity of native animals in natural portions of parks as part of the park ecosystem."

Park informational handouts caution visitors not to feed wildlife. Signs are located along the Many Glacier road, advising drivers to be alert for animals along the roadway, and reminding visitors not to feed wildlife. Park personnel contact visitors who are observed in close contact with sheep, and citations are issued for violations of regulations.

Research by qualified investigators is encouraged. Preliminary attempts at aversive conditioning were made by Sub-district personnel in 1978, and were highly successful in reducing roadside begging. On-going research should provide additional information about sheep in the park.

Current action appears to have been successful in effecting a sharp reduction in the number of roadside feeding incidents, primarily by discouraging sheep from frequenting roadsides. However, animals still approach the road on occasion.

3. Alternative Actions and Their Probable Impacts.

a. No Action. Allow natural and un-natural behavior among sheep population. This will lead to more poaching and injury from vehicles.

b. Continue present management action, which includes education of the visitors, law enforcement, and aversive conditioning when necessary. This alternative should maintain the problem at low levels, but would not eliminate it entirely. Aversive conditioning efforts could result in public criticism, due to misunderstanding, if they are not carefully controlled. Long-range effects of such conditioning are not well understood.

Continue efforts at aversive conditioning, and explore other possible techniques in cooperation with the Research Division. Capture and relocation of individual problem animals may be considered if other methods are not effective. Due to the expense involved, relocation is not feasible for large numbers of sheep.

c. Increase "supervision" by National Park Service personnel to insure that animals which approach the road are not fed by visitors. This would allow visitors to continue to view the animals at close range. This alternative may slightly reduce the potential safety hazards to both visitors and animals. It would require the stationing of a uniformed employee in the Swiftcurrent Falls vicinity during the visitor season, for approximately 12 hours per day. This could not be accomplished with existing staffing, and in view of more pressing needs, would not be high priority or cost effective.

d. Adopt sterner wording on signs and in handouts, advising visitors of the consequences of feeding wildlife, both to the visitor and the animal. Increase enforcement actions against violators. This alternative would require at least some increase in patrols, and may have a negative impact on the Service's image as a visitor-oriented organization.

4. Recommended Course of Action.

Alternative B is the recommended course of action. This alternative includes education of visitors, law enforcement, and aversive conditioning when

necessary. This combination has, in the past, been successful in promoting natural behavior in the sheep population.

a. Resource Management. Continue to strive to instill natural behavior among Bighorn sheep population in the Park. Work with Research in gathering additional information about sheep.

b. Monitor. Monitor populations and monitor the effects of aversive conditioning on the sheep population.

c. Research. Encourage research by qualified investigators.

Commitment to Accomplishments

FY 1983 - Continue to promote natural behavior in Bighorn sheep population
FY 1984 - Same as FY 1983
FY 1985 - " " " "
FY 1986 - " " " "
FY 1987 - " " " "

1. GLAC-N-0017 OTHER MAMMAL Management

2. Statement of Problem. Ungulates, such as elk, deer, and moose, and predators, such as mountain lion, lynx, bobcat, coyote and wolverine, plus a multitude of small mammals, inhabit Glacier National Park. Evidence shows that two mammals, the mountain bison (Bison bison athabacae), and mountain caribou (Rangifer tarandus caribou), were extirpated from the area before it was designated as Glacier National Park.

Ungulates of the deer family depend heavily on winter range of grasslands, aspen groves, shrubfields and riparian communities. The winter ranges are often near the Park boundary. Hunting pressure adjacent to the Park on the west results in the mortality of animals that move out of the Park during the State hunting season. Hunting pressure on the east side adjacent to the Park is year round and unlimited (with the area adjacent to St. Mary excepted in 1983), having the effect of removing individuals from the natural population and limiting natural movements to a larger winter range outside the Park.

Ungulate populations on the east side have a fluctuating nature, and have been monitored by Subdistrict Rangers. Census figures are better for areas that are visible from valley roadways. Census figures for more isolated areas are sporatic at best, as winter travel to isolated backcountry areas is not made on a systematic basis. The west side winter ranges are monitored by the Research Biologist, and an excellent data base has been maintained over a number of years.

Management by Blackfeet officials of elk hunting adjacent to the Park on the east side could be effective in future years for either limited expansion of the St. Mary herd, or to enhance the herd size in down cycle years. This same herd was subject to an NPS direct reduction program in the 1960's.

Preditors must wander over large territories, due to their role as secondary consumers. Periodically, they move outside the park, where they are subject to hunting and trapping. The Park may act as a reservoir of dispersing preditors. At present, there are no problems with livestock depredations outside the Park. Park populations seem to be sustaining and self-regulating, although census data is sporatic. Wolverine are rare in the conterminous United States, but seem to be relatively common in old-growth forests and alpine areas in the Park. The wolverine has no special legal status, as a threatened or endangered species.

Animals of commercial fur bearing value, such as beaver and marten, are subject to trapping adjacent to the Park, and possible illegal poaching inside the Park near boundaries. These animal populations seem to be sustaining and self-regulating.

All wildlife in GNP are protected by Title 36, Code of Federal Regulations. All wildlife is subject to poaching, auto accidents, and human influence inside and outside the Park, which may change their natural behavior and movements.

Caribou inhabited the North Fork area of the Park, within historic times. Viable populations of caribou exist in southwestern British Columbia, and a remnant

population exists in northern Idaho. The Park habitat could be evaluated to ascertain if caribou could be reintroduced, restoring an impressive native species to the Park. The donor population would have to be the more viable B.C. herd. This would involve negotiations with B.C. wildlife officials.

3. Alternative Actions and Their Probable Impacts.

a. No program. Discontinue wildlife observation, patrols, and census records. Do not inter-act with wildlife management officials of adjacent agencies, park, reservations. Provide little or no legal protection against poaching in the Park. Relations with neighboring agencies may deteriorate. This alternative would have a negative impact on wildlife, due to increased poaching and unknown human influences on wildlife.

b. Continue observations, patrols, and keep census records. Attempt to get accurate count each winter for each significant ungulate unit. Make regular boundary and interior patrols, especially around winter congregations. Keep informed of population trends and range conditions. Maintain contacts and provide input to adjacent agency wildlife officials, as a means of managing Park wintering ungulate populations, and sharing poacher information.

c. Consider the feasibility of translocating mountain caribou from Canada into the North Fork. This would consider the adequacy of appropriate habitats in the Park, exposure to human pressure outside the Park, and the risk to the donor population. This would lead to later reintroducing caribou or deciding the range is too marginal, and dropping the project.

d. Increase monitoring effort. Make sure field rangers efforts are coordinated with the Research Biologist, so that the correct types of data are collected. Improve data storage to prevent loss of old wildlife census reports, etc. Increase winter patrols in wildlife use areas, and more remote potential use areas of the Park. At times this may be difficult with current staffing levels. This would lead to reduced poaching, and better information on wildlife movements. Data storage would be improved by an active system to prevent disappearance of historic wildlife reports.

4. Recommended Course of Action. Alternative b, c and possible d. Alternative d would require rangers to spend more time away from the road, which may not be possible due to other workloads.

a. Resource Management. Rangers will perform patrol function, make observations, and keep wildlife records. Information will be shared with the agency game managers. Park management will work with other agencies on wildlife policy, season, etc.

b. Monitoring. Rangers will monitor, with cooperation of Research Biologist, to ensure continuity. Research will keep long-term population records, consider trends, and assist in range condition evaluations.

c. Research. Research will evaluate caribou habitat and study long-term wildlife populations.

Commitment to Accomplishments.

FY 1983	Continue a step-up wildlife monitoring, other agency contacts.
FY 1984	Same as above. Begin caribou habitat evaluations.
FY 1985	" " " " " " "
FY 1986	" " " " " " "
FY 1987	" " " " " " "

1. GLAC-N-018 FOREST INSECT AND DISEASE Management

2. Statement of Problem. In recent years large acreages of trees have been subjected to forest insects, i.e. pine beetles, and disease, i.e. blister rust. Native insects and diseases occurring under natural conditions are natural elements of the ecosystem. In a national park these elements and the processes of which they are a part are to be preserved. Glacier National Park has experienced an extensive and intensive increase in Mountain Pine Beetle activity, particularly in the North Fork Valley lodgepole pine forest. While the pine beetle infestation appears to have passed its peak of activity, infestation can be expected to continue for several years on a much reduced scale. This increased pine beetle activity is highly visible. There is no known method of preventing or suppressing Moutain Pine Beetle epidemics in mature even-aged lodgepole pine stands. Even-aged lodgepole pine forests may not have existed to the extent during pre-Anglo times as they do now because of alterations in the natural fire regime.

Glacier will follow Park Service policy for natural area and wilderness management by allowing the mountain pine beetle to interact with the lodgepole pine forest without interference or timber salvage efforts. The National Park receives annual surveys and forecasts from the U.S. Forest Service, the agency responsible for providing insect and disease expertise for all federal forests. The U.S. Forest Service conducts periodic surveys, prepares maps and provides forecasts relating to the North Fork epidemic. The U.S. Forest Service Division of Insect and Disease Management conducts annual training sessions for park employees.

At present the natural processes are preserved. Lodgepole pine, a seral species is being succeeded by spruce and Douglas fir. The dead trees will eventually return nutrients to the system. Native insects and birds are allowed to interact without interference from human managers and other natural events are allowed to occur. Park personnel will be better informed so that they will be prepared to adequately interpret forest insect and disease occurrences.

The Mountain Pine Beetle activity is interpreted to park visitors as a natural phenomenon.

Research is underway to investigate the numerical response of woodpeckers and their effect on the mortality of beetles in lodgepole pine.

The increasing number of dead and dying lodgepole pine trees will alter fuel loadings and fire potential, but the precise magnitude is not yet known.

The increased numbers of dead and dying lodgepole pine trees in and around developed areas will increase the potential for hazards to property and life; however, Glacier National Park's hazardous tree program (GLAC-N-006) will strive to remove hazard trees in developed areas as soon as possible.

3. Alternative Actions and Their Probable Impacts.

a. No Action. Allow beetle populations to interact with other plants and animals in the lodgepole pine forest without human interference. Monitor spread of populations, assess results. Interpret this phenomenon for the benefit of park visitors and local land-owners. Encourage and support scientific research.

b. Carry Out Salvage Cutting. This would yield some economic return. Salvage cutting would be contrary to Service policies and probably would not contribute to control or prevent the spread of the infestation. This would have adverse effects on other elements of the ecosystem.

c. Carry Out Insecticide Spraying. It may temporarily reduce beetle numbers; however, past spraying programs did not control the epidemics. It would be contrary to National Park Service policies and would have devastating effects on the ecosystem.

d. Apply Sevimol-4 chemical to selected trees in developed areas. This may prevent attack of some individual trees. It will be costly and may have adverse ecological effects.

4. Recommended Course of Action. Alternative a. above is recommended. Prepare maps, photographs, written descriptions and other materials that will aid in the interpretation of the mountain pine beetle in the lodgepole pine forest. Conduct studies to accurately assess the ecological role of the mountain pine beetle in forest succession and in altering forest fuels.

A. Resource Management: Prepare maps, photographs, written descriptions and other materials that will aid in the interpretation of the mountain pine beetle.

B. Monitoring: Monitor spread of infestation and fuel loading caused by dead or dying trees.

C. Research. Study changing pattern of wildlife as forest composition changes

Commitment to Accomplishments

FY 1983 - Monitor spread of forest infestation. As possible, remove hazard trees from developed areas.

FY 1984 - Same as FY 1983

FY 1985 - Same as FY 1983

FY 1986 - Same as FY 1983

FY 1987 - Same as FY 1983

1. GLAC-N-019 WOLF Management

2. Statement of Problem. Wolves are an endangered species and may frequent Glacier National Park. Wolf populations were greatly reduced by about 1900, primarily, because of depredations by settlers and professional hunters, and because of human-caused habitat change. Reductions have continued, under the guise of "predator control" until recent times. At least thirteen wolves were shot or trapped in the vicinity of the Park between 1948 and 1956.

Recent sightings and occasional trapping of wolves indicate that a remnant population of the endangered Northern Rocky Mountain wolf (listed as (Canus lupus irremotus) still utilizes the park and adjoining areas during at least part of the year. Little data is available concerning size, composition or range of the current population. Sightings during the past two decades have been limited to either single animals or pairs of wolves. A pair of wolves raised a litter northwest of the park in 1982, near the Sage Creek Coal Mine site. Since some investigators feel that pack size is an indicator of the relative abundance of wolves in a given area, these sightings suggest that the wolf population in the Park is quite low. It is also probable that there are no resident groups of wolves within the Park. The largest number of recent sightings and sign have been located in the North Fork of the Flathead River Drainage, and along the Park's eastern boundary.

The wolves' historical range includes all of Glacier National Park and encompasses an area extending from eastern Washington to eastern Montana, and from southern British Columbia and Alberta to northern Wyoming. The once abundant wolf is rarely seen, its status is marginal and its ecological roles is negligible.

Wolves are protected within the park under provisions of Title 36, Code of Federal Regulations. They are also protected within most of the historical range of C. lupus, under the provisions of the Endangered Species Act of 1973.

There are established procedures for reporting sightings of wolves or wolf sign in the park to University of Montana and State wildlife personnel.

The Park is providing some support for the Wolf Ecology Project being conducted by investigators from the University of Montana. Support consists mainly of permission to conduct research within the Park, logistical help and cooperation by field personnel in relaying wolf sighting reports to project workers. The project is investigating the status of C. lupus irremotus throughout much of its former range, so project activities extend well beyond the boundaries of Glacier National Park.

Wolves are afforded the same degree of protection as other wildlife in the Park. Additional information about the current status of wolves in the Park is being obtained through the Wolf Ecology Project by means of direct observation of wolves and wolf sign, and the assimilation of reliable sightings by others, including Park personnel.

3. Alternative Actions and Probable Impacts.

A. No action. Discontinue support for the University Wolf Ecology Project. Allow remaining wolves to either accommodate to ongoing habitat deterioration or risk the possible extinction of wolves in the future. Assume that information obtained about wolves within the former range of C. lupus irremotus outside the Park will be adequate and relevant for Park management needs. This alternative would not support the Park's

mission of providing protection for and information about native wildlife and endangered species. Discontinuing the minimal support provided the Wolf Ecology Project would not enhance other Park programs.

B. Provide modest support for the Wolf Ecology Project. Continue protection of wolves and wolf habitat incidental to other resource management actions, and the Park's and Service policies. This alternative would probably provide additional information about wolves. Some improvement of wolf habitat would likely occur.

C. Continuation of sighting and reporting efforts. Consider protection and improvement of habitat for wolves in all Park resource and development plans. Continue systematic efforts by Park personnel to observe and report wolf sign and sightings. Continue sharing wolf sign data with University of Montana Wolf Ecology Project, and State Game Biologists at Montana State University.

Utilize Resource Management Rangers to coordinate an intensification of searches for wolves and training for field personnel. Make official direct contact with neighboring agencies to express NPS concern about the impact their land management actions may have on the survival and well-being of wolves, along with other wildlife, which may utilize habitat common to the Park and adjoining agencies. This alternative would provide additional information about and protection of wolves in the Park and surrounding area.

D. Reintroduce C. lupus irremotus to the Park. Adequate research and preparation would be necessary and to avoid possible adverse effects on existint wolf populations and the habitat. Losses of at least some reintroduce individuals due to migration across Park boundaries could be expected.

4. Recommended Course of Action. Alternative C is recommended. Logistical support, such as communications and housing, should continue to be provided on an as-available basis to individuals engaged in approved research programs.

The importance of reporting all wolf sightings and sign should be stressed to all NPS personnel. The two Resource Management Rangers should work closely with the Wolf Ecology Project personnel, and should incorporate efforts to gain additional data on wolves into their field activities.

Research activities in the Park should emphasize techniques, which have the least potential for disrupting existing wolf populations. Live-trapping and the use of scent stations should be conducted only with the approval of the Supervisory Research Biologist and the Chief Ranger, in order to maintain control over potential disruptions of the small population of wolves which may exist in the area. The location of any live-trapping sites or scent stations will be approved in advance by the District Ranger of the area where these activities would take place.

A. Resource Management. Work with the Wolf Ecology Project personnel and incorporate efforts to gain additional data on wolves. Consider impact on wolves and wolf habitat in all Park DCP's, particularly in the North Fork area.

B. Monitoring: Report all wolf sightings and contact Wolf Ecology Project personnel of sightings.

C. Research: Emphasize techniques which have the least potential for disturbing wolf populations.

Commitment to Accomplishment:

FY 1983. Continue to report all wolf sightings and work with Wolf Ecology Project personnel on gathering additional data.

FY 1984. Continue to report all wolf sightings and work with Wolf Ecology Project personnel on gathering additional data.

FY 1985. Continue to report all wolf sightings and work with Wolf Ecology Project personnel on gathering additional data.

FY 1986. Continue to report all wolf sightings and work with Wolf Ecology Project personnel on gathering additional data.

FY 1987. Continue to report all wolf sightings and work with Wolf Ecology Project personnel on gathering additional data.

1. GLAC-N-020 CAVE Management

2. Statement of Problem. Although Glacier National Park has considerable geological significance, it is not noted for its scenic or extensive cave systems. Only five caves have been discovered in the park despite an aerial survey for possible new cave entrances in 1976. Those located to date have been named Algal, Zoo, Poia Lake, Jens and Haystack Mountain Caves. All but Haystack Mountain Cave have been extensively explored. Algal, Zoo and Poia Lake caves appear to have the greatest significance.

These three caves are unique as they are the only known caves in the Precambrian formation in Montana. Recent identification of a new species of amphipod in both Zoo and Algal caves is important since these are both new to science and are the first troglobites to be identified in Glacier National Park. Zoo Cave contains extensive deposits of animal droppings and unidentified mammal remains. In parts of Zoo Cave, organic debris have accumulated to a depth of nine feet. The cave's dry conditions have provided an ideal situation for the preservation and study of potentially significant resources. Poia Lake Cave is the largest in the park and does not appear to contain a fragile or unique ecosystem. It offers the best opportunity for recreational use by qualified groups of any of the known caves in the park.

Historically, Glacier's caves have not attracted large numbers of spelunkers. The earliest known mention of park caves is found in correspondence between Ranger Joe Cosley and a geologist in 1927. Ranger Cosley was to guide the geologist to a "large cave in the broken arm country of Glacier." However, the geologist died before the trip was accomplished and the location of the "broken arm country" is not known today.

A brief article about Poia Lake and Algal Caves appears in the Summer, 1977 issue of Alpine Karst. To date, extensive exploration of park caves is believed to have been limited to cave researchers.

The first scientific research on Glacier's caves was conducted by Campbell in 1975. Additional studies were conducted by Campbell, Chester and Munthe in 1976 and by Campbell, Chester and Zuber in 1977. Chester is continuing a study on biological aspects of the caves. Poia Lake Cave has been mapped for a distance of 4252 feet, Algal Cave for 2060 feet and Zoo Cave for 713 feet. Jens Cave is a short, single passage about 300 feet long and has little scientific or recreational potential.

None of the park caves located to date are appropriate for development as scenic attractions.

Caves within the park are protected by provisions of Title 36, Code of Federal Regulations (36 CFR 2.20. Preservation of Natural Features).

National Park Service policy for Cave Management includes provisions for restricting access to caves when necessary for human safety or for the protection of cave resources. Current park policy is to not publicize or encourage visitor use of caves and cave locations are not indicated on park maps or brochures.

The entrance and interior of Algal Cave are subject to flooding. In order to protect both visitors and the cave's fragile environment, a locked metal gate has been installed at the cave's entrance. Access is limited to persons conducting research in the cave. Use of Zoo Cave is also officially limited to researchers. Visitor use of Jens and Poia Lake caves is permitted by properly experienced groups.

Three cave studies have been conducted since 1975. All known caves have been studied and mapped to at least some extent. No NPS funds are currently allocated for cave studies in the park.

To date, only minor degradation of cave resources is known to have occurred, primarily in Algal Cave. The gate at Algal Cave should reduce further vandalism.

Caves with significant scientific value are being restricted to use by researchers.

3. Alternative Actions and Their Probable Impacts.

a. No Action. Allow use of caves without any restrictions. This would lead to degradation of the caves and the potential for accidents would increase since exploration by inexperienced individuals would likely increase.

b. Publicize the location of all caves in the park and allow for use by any interested visitor. This alternative would add little to the park experience for the vast majority of visitors and would likely speed destruction of important scientific resources. Safety hazards could result, especially in Algal Cave, since exploration by inexperienced individuals would likely increase.

c. Install gates at entrances to all known caves in the park to prevent unauthorized entry. This alternative would afford the greatest protection from vandalism. It would, however, be unduly expensive, it would require alteration of the basic resource and would tend to attract attention to rather than protect some caves. Gates may also interfere with use of the caves by native wildlife and therefore diminish their scientific as well as their ecological value.

d. Provide only minimal physical protection for the caves, primarily through a lack of publicity about their locations. Little physical control over access to and use of caves, except Algal Cave, would be provided.

   Research would be encouraged. This would provide needed information on the caves' resources.

4. Recommended Course of Action. It is recommended that we proceed under Alternative d.

A. Resource Management: Do not publicize cave presence. Put in physical restraints when necessary for life/safety or resource protection.

B. Monitoring: Monitor use of caves.

C. Research: Research is encouraged. Little is known about Glacier National Park caves and research would provide needed information.

Commitment to Accomplishments

FY 1983 - Continue to protect cave resources through a lack of publicity.

FY 1984 - Same as FY 1983

FY 1985 - Same as FY 1983

FY 1986 - Same as FY 1983

FY 1987 - Same as FY 1983

5-YEAR PROGRAMMING SHEETS

RESOURCES PROGRAMMING SHEET

Glacier National Park (Park) | RMRO (Region) | Montana (State) | Natural X | Cultural

Area Priority	RPM Ref.No.	PROJECT TITLE	Action Type	FY 83 YEAR 1 NPS M.Y.	FY 83 YEAR 1 Cost/ $1000	FY 84 YEAR 2 NPS M.Y.	FY 84 YEAR 2 Cost/ $1000	FY 85 YEAR 3 NPS M.Y.	FY 85 YEAR 3 Cost/ $1000	FY 86 YEAR 4 NPS M.Y.	FY 86 YEAR 4 Cost/ $1000	FY 87 YEAR 5 NPS M.Y.	FY 87 YEAR 5 Cost/ $1000
1	N-001	Bear Management	A-B	10.9	243.0	16.0	337.0	16.0	353.9	16.0	371.5	16.0	390.1
2	N-002	Fire Management	A-B	6.3	124.0	6.3	130.2	6.3	136.7	6.3	143.6	6.3	150.7
3	N-003	Adverse Activities	A-B	0.4	10.0	3.0	51.6	3.0	54.2	3.0	56.9	3.0	59.7
		A. Sage(Cabin) Creek Coal Mine											
		B. Logging near Park Boundary											
		C. Oil and Gas Leasing Exploration											
4	N-004	Backcountry Management	A-B	0.9	23.4	0.9	24.6	0.9	25.8	0.9	27.1	0.9	28.4
5	N-005	Domestic Livestock Trespass Mgt	A-B	0.4	8.5	0.4	8.9	0.4	9.4	0.4	9.8	0.4	10.3
6	N-006	Hazard Tree Management	A-B	0.5	10.0	0.5	10.5	0.5	11.0	0.5	11.6	0.5	12.2
7	N-007	Vegetation Management	A-B	1.0	26.6	1.0	27.9	1.0	29.3	1.0	30.8	1.0	32.3
		A. Rehabilitation of Disturbed Sites											
		B. McGee Meadow											
8	N-008	Airshed Management	A-B	2.0	50.0	3.6	72.5	3.6	76.1	3.6	79.9	3.6	83.9
9	N-009	Water Quality Management	A-B	0.1	2.5	0.1	2.6	0.1	2.8	0.1	2.9	0.1	3.0
10	N-010	Aquatic Ecosystems Management	A-B	1.0	23.0	1.0	24.2	1.0	25.4	1.0	26.6	1.0	28.0
11	N-011	River Use Management	A-B	0.4	9.4	0.4	9.9	0.4	10.4	0.4	10.9	0.4	11.4
12	N-012	Exotic Plant Management	A-B	0.1	2.6	0.1	2.7	0.1	2.9	0.1	3.0	0.1	3.2
13	N-013	Bald Eagle Management	A-B	1.5	40.2	1.5	42.2	1.5	44.3	1.5	46.5	1.5	48.9
14	N-014	Mountain Goat Management	A-B	0.3	4.0	0.3	4.2	0.3	4.4	0.3	4.6	0.3	4.9
		A. Gunsight Pass - Sperry Glacier											
		B. Walton Mineral Lick Area											
15	N-015	Winter Use Management	A-B	0.4	8.5	0.4	8.9	0.4	9.4	0.4	9.8	0.4	10.3
16	N-016	Bighorn Sheep Management	A-B	0.1	2.6	0.1	2.7	0.1	2.9	0.1	3.0	0.1	3.2
17	N-017	Other Mammal Management	A-B	0.4	8.0	0.4	8.4	0.4	8.8	0.4	9.3	0.4	9.7
18	N-018	Forest Insect & Disease Managment	A-B	0.3	4.0	0.3	4.2	0.3	4.4	0.3	4.6	0.3	4.9
19	N-019	Wolf Management	A-B	0.1	2.0	0.1	2.1	0.1	2.2	0.1	2.3	0.1	2.4
20	N-020	Cave Management	A-B	0	0	0.1	2.1	0.1	2.2	0.1	2.3	0.1	2.4

ENVIRONMENTAL ASSESSMENT

ENVIRONMENTAL ASSESSMENT

NATURAL RESOURCE MANAGEMENT PLAN

Summmary: The natural resource management section of the Resource Management Plan lists twenty project statements, many of which are limited to protection and monitoring, and not resource manipulation. Of all the resource manipulative type projects, the most significant at this time are bear management and fire management.

Among the project statements primarily limited to monitoring and protection are:

1. Adverse Activity Monitoring (external threats)
2. Domestic Livestock Trespass Management
3. Airshed Management
4. Water Quality Management
5. River Use Management
6. Mountain Goat Management
7. Winter Use Management
8. Bighorn Sheep Management
9. Other Mammal Management
10. Wolf Management
11. Cave Management

These programs involve projects such as site identification, baseline data monitoring and population dynamics.

Three programs that result in direct manipulation of the vegetative ecosystem are vegetation management, hazard tree management, and exotic plant management.

All twenty of Glacier's project statements are important to the overall resource management of the Park. The cumulative impacts of all the project statements will have a positive impact that will allow management to maintain Glacier's goal set forth in the Master Plan:

> Park ecosystems will be managed to protect, preserve, or restore, where necessary, natural biotic relationships for the scenic, educational, and scientific benefit of the visitor.

The following project statement matrices are a summary of the impacts, the details for each statement can be found in the text under the individual action "alternatives."

These statements are not intended to preclude the need for additional environmental assessments or environmental impact statements or any specific project.

GLAC-N-001

PROJECT STATEMENT TITLE: BEAR MANAGEMENT

NEED FOR THE PROPOSAL: Glacier N.P. will protect and maintain natural habitat and status of Grizzly and Black bears, and provide for maximum security and safety to the park visitor, while recognizing the dangers of a natural wilderness.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Manage Glacier N.P. for compatibility of use by bears & people	Allow Free use of all areas of the park by bear and people	Manage bears only	Manage people only	Manage park for Compatability of use by bears & people No action	Designate areas for no human entry
Visitor Use	Bear-human encounters would be minimized. Injuries & property damage minimized	Bear-human encounters would be significantly increased resulting in more injuries & damage	Same as "A"	Bear-human encounters would be reduced	Selected alternative	Bear-human encounters would be reduced in selected drainages only
Fish Wildlife	Will afford the GRizzly protection as required by the endangered species Act and reduce Bear-human confrontations. Bear no.'s would remain stable.	Bear no.'s would be reduced due to incompatability with humans	Same as "A"	Bear-human encounters would be eliminated.	Selected alternative	Bear no.'s increased depending upon no. of areas closed.

PROJECT STATEMENT TITLE: CLAC-N-002
FIRE MANAGEMENT

NEED FOR THE PROPOSAL: RESTORE AND MAINTAIN NATURAL FOREST ECOSYSTEM

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternatives A C &D Some natural fire plus intro fire where necessary	Allow all fires to burn	Total suppression of all fires	Allow some natural fires to burn. No action	Introduce fire where a specific major need is demonstrated. No action)	
Vegetation Soils	Selected Alternatives	Unnatural plant sucession & large fires will alter soil composition	Unnatural species composition and lower nutrient levels in soils	Gradual restoration of natural state	Restore soil nutrient levels and allow plants that need fire to germinate & grow	
Fish and Wildlife	"	Unnatural animal populations will occur	Limited diversity of animal species	Gradual resoration of natural populations	Restore natural animal populations to area	
Water Resources and Quality	"	Toxic levels of ash entering water after large fires	Minimal	Some contamination but within natural parameters	Some contamination but within natural parameters	
Air Quality	"	May result in poor air quality during fire	No effect	May result in poor air quality during fire	May result in locally poor air quality during fire	
Aesthetics	"	Visibility may be impaired during large or multi fire Situations	Less diverse forest types	More diverse forest ecosystems. Some air quality impairment during fire	More diverse forest ecosystems. Some air quality impairment during fire	
Visitor Use	"	May limit some backcountry use during fire	No limitation on backcountry use	May limit some backcountry use during fire	May limit some backcountry use during fire	

PROJECT STATEMENT TITLE: GLAC-N-003
ADVERSE ACTIVITIES
A. Sage (Cabin) Creek Coal Mining

NEED FOR THE PROPOSAL: Proposed coal mine may have significant negative impacts to the entire North Fork (Western Boundar area of G.N.P.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternatives B & C Continue to monitor project & collect base line data	Refrain from getting involved in project	Continue to monitor proposed projects	Obtain base line natural resources data to measure impacts)		
Vegetation Soil	Proposed action will reduce environmental damage	Vegetation and soil may sustain severe damage	Monitoring alone may result in negative impacts	Obtaining base line data alone may result in negative impacts		
Fish and Wildlife	Proposed action will reduce negative impacts and attempt to maintain fish and wildlife numbers	Reduction in numbers & habitat	"	"		
Water Quality	Proposed action will attempt to maintain water quality	May be severly impacted	"	"		
Air Quality	Proposed action will attempt to maintain class I air quality	Class I air quality may be impaired	"	"		
Visitor Use	Visitor use of area would not be affected	Reduce visitor use	"	"		

PROJECT STATEMENT TITLE: GLAC-N-003
ADVERSE ACTIVITIES (THREATS)
B. LOGGING NEAR PARK BOUNDARY

NEED FOR THE PROPOSAL: Logging along Glaciers border and boundary may cause adverse environmental conditions.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternatives B & C Continue to monitor project & collect base line data	Refrain from getting involved in project	Continue to monitor proposed project No action	Obtain base line natural resources data to measure impacts)		
Vegetation Soil	Proposed action will reduce environmental damage	Vegetation & soil may sistain severe damage	Monitoring above may result in negative impact	Obtaining base line data alone may result in negative impacts		
Fish and Wildlife	Proposed action will reduce negative impacts and attempt to maintain fish & wildlife numbers	Reduction in in numbers & habitat	"	"		
Water Quality	Proposed action will attempt to maintain water quality	May be serverly impacted	"	"		
Air Quality	Proposed action will attempt to maintain class I air quality	Class I air quality may be impaired	"	"		
Visitor Use	Visitor use of area would not be affected	Reduced visitor use	"	"		

PROJECT STATEMENT TITLE: GLAC-N-003
ADVERSE ACTIVITIES (THREATS)
C. OIL AND GAS LEASING AND EXPLORATION

NEED FOR THE PROPOSAL: Oil and Gas activities along the park boundary could have adverse impacts on the park ecosystem if not carried out in environmentally sound ways.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Alternative B - work with agencies and encourage environmentally sound	NO PROGRAM A Refrain from getting involved in projects	ALTERNATIVE B Work with agencies and encourage environmentally sound practices)	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
Vegetation Soil	Not be affected	May cause damage	Proposed action			
Fish & Wildlife	Numbers should not be affected	Numbers reduced	Proposed action			
Water Quality	Maintains high standard of water quality	Quality may become degraded	Proposed action			
Air Quality	Maintain Class I standard	Would not maintain Class I standard	Proposed action			
Visitor Use	Not affected	Reduced visitation	Proposed action			

PROJECT STATEMENT TITLE: GLAC-N-004 BACKCOUNTRY MANAGEMENT

NEED FOR THE PROPOSAL: Efforts are needed to avoid and correct resource degredation and bear-human conflicts in the backcountry of G.N.P.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternative B Mandatory permits and specific locations for zone concept)	Abandon the mandatory permit system	Control use through mandatory permits & allow for zones	Park wide system of zones in specific locations. No action)		
Vegetation Soils	Suffer least amount of degredation	Degredation would increase	Selected alternative	Degredation would increase		
Air Quality	Meet Class I standards	Meet Class I standards	"	Meet Class I Standards		
Water Quality	Would remain high quality	May suffer some negative impacts	"	May suffer negative impacts		
Visitor Use	Not be affected	Extremely high use during July and August	"	Can anticipate increases		
Fish Wildlife	People/Wildlife conflicts reduced to minimum	Conflicts between people and wildlife	"	May cause people/wildlife conflicts		

PROJECT STATEMENT TITLE: GLAC-N-005
DOMESTIC LIVESTOCK TRESPASS MANAGEMENT

NEED FOR THE PROPOSAL: Continued livestock trespass is causing numerous environmental problems.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternatives B & E Continue patrols and work with Tribal Council & Grazers)	Allow livestock to continue to trespass	Continue range at present level No Action	Increase law Enforcement	Conduct a fencing program	Work with those who are involved with the tresspas animals
Vegetation Soils	Native vegetation loss eliminated. No erosion due to trespass	Native vegetation loss - Exotic species increase increase erosion	Reduced native vegetation loss - Exotic species increase some erosion	Reduced native vegetation loss. Exotic species would increase erosion	Native vegetation loss eliminated	Suggested Alternative
Wildlife	No disease transmittal. No habitat loss	Potential disease transmittal. Habitat loss	Potential disease transmittal. Habitat loss	Potential disease transmittal. Some habitat loss	No disease transmittal. No habitat loss	Suggested Alternative
Water Quality	Eliminate pollution caused by trespass	Polution to domestic and natural water supply	Some pollution to domestic & natural water supplies	Some pollution to domestic & natural water supplies	Eliminate polution caused by trespass	Suggested Alternative
Visitor Safety	Park roads would be safe	Road hazard	Road hazard	Some road hazard	Park roads would be safer	Suggested Alternative

PROJECT STATEMENT TITLE: GLAC-N-006 HAZARD TREES MANAGEMENT

NEED FOR THE PROPOSAL: Hazard trees in areas of high use (Camp ground, picnic areas, etc.) increase the risk of injury and property damage.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternative C Survey and treat high priority trees	Eliminate Surveys & treatments	Eliminate hazards as they become evident	Survey and treat high priority trees		
Visitor use	Would not be affected	May be reduced due to necessary area closures	May be reduced due to necessary area closures	Selected alternative		
Wildlife	Some habitat loss due to removal of trees	No natural habitat loss	May be minimal habitat loss by wildlife using hazard trees	Selected alternative		
Vegetation Soil	May be some vegetation change due to rapid elimination of large no.'s of hazard trees	No change from natural process	No change at this level	Selected alternative		

PROJECT STATEMENT TITLE: GLAC-N-007 VEGETATION MANAGEMENT
A. REHABILITATION OF DISTURBED SITES

NEED FOR THE PROPOSAL: Recognition of past errors in rehabilitation efforts has increased awareness of the need for ecologically sound approaches to future projects.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternative B Evaluate and determine correct rehab action and thenproceed with rehab)	Allow rehab through natural process.	Evaluate & determine correct rehab action & then proceed with rehab)			
Vegetation Soils	Disturbed sites will be rehabed with native vegetation. Soils would remain natural	Introduction of exotic vegetation. Soil erosion would be enhanced	Selected Alternative			
Wildlife	Habitat would remain stable	Introduction of exotics may change habitat and change wildlife patterns.	Selected alternative			
Visitor Use	Remain unchanged	May be reduced due to visual impact-erosion	Selected alternative			
Water Quality	Reduce potential for decreased water quality caused by erosion	Erosion potential high. Stream degredation and water quality deterioration				

PROJECT STATEMENT TITLE: GLAC-N-007 VEGETATION MANAGEMENT
B. MCGEE MEADOW

NEED FOR THE PROPOSAL: McGee Meadow is a sensitive area, containing rare sedge species, and frequented by many species of wildlife.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternative C- Place signs, patrol and research area	Allow unregulated use of meadow	Designate area as unique ecological unit	Place signs, patrol, and research area. No action		
Vegetation Soils	Offers protection of rare species and protection of meadow	Would offer no protection for rare species of flora	Would offer greatest protection for rare species of flora	Selected alternative		
Fish Wildlife	Some harassement of wildlife due to overlook	Conflicts between man and wildlife would increase	Would enhance area for wildlife	Selected alternative		
Visitor use	Overlook is not impacted. Some unregulated use of meadow may occur	Use of meadow would increase stability	May be very restricted due to designation	Selected alternative		

PROJECT STATEMENT TITLE: GLAC-N- 008 AIR SHED MANAGEMENT

NEED FOR THE PROPOSAL: Glacier National Park will Maintain Class I Air Quality Standards and Protect Air Quality Related Values (AQRV)

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Alternate C provides for continuation of monitoring for baseline air quality, plus effect research	NO PROGRAM A Eliminate all monitoring in the Park	ALTERNATIVE B Continue monitoring at present level	ALTERNATIVE C Expand monitoring program & include effects research on resources	ALTERNATIVE	ALTERNATIVE
Visibility	Can determine baseline quality & detect violations of standard	Will not determine baseline level of quality or if it is changing	Can determine baseline quality & detect violations of standard	End result is protection of this AQRV		
Flora	Can determine if this air quality related value is effected by pollution	Will not know if flora is effected by pollution	Will not know if flora is effected by pollution	End result is protection of this AQRV		
Fauna	"	Will not know if fauna is effected by pollution	Will not know if fauna is effected by pollution	"		
Aquatic	"	Will not know if aquatic systems are effected by pollution	Will not know if aquatic systems are effected by pollution	"		
Soil	"	Will not know if soil chemistry & organisms are effected by pollution	Will not know if soil chemistry & organisms are effected by pollution	"		
Air Quality	Can determine baseline violation of standard & need for enforcement to maintain Class I standard	Will not know baseline air quality & will not have basis for enforcing standards	Will gather data but don't know effect pollution is having on resources	End result is maintenance of Class I status & protection of AQRV		
Visitor Use	Promotes quality of experience through maintenance of Class I standard & protection of resources visitors come to enjoy	Air quality regulations would be unenforceable & quality of experience would deteriorate	No knowledge of effects of pollution may result in deterioration of resource values the visitor is coming to see	Protection of resource provides ultimate opportunity for quality experience		

PROJECT STATEMENT TITLE: GLAC-N-009 WATER QUALITY MANAGEMENT

NEED FOR THE PROPOSAL: Glacier Park's aquatic ecosystem is threatened by numerous sources of potential damage from pollution

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Selected Alternatives are B, C, D, E, F, and G	NO PROGRAM A No program	ALTERNATIVE B Main-stem North Fork Research	ALTERNATIVE C North Fork Tributaries monitoring	ALTERNATIVE D Sewerage impact studies	ALTERNATIVE E Acid rain research
Water Quality	Prevention of degredation of water quality	Degradation would probably occur	Goal is maintenance of existing water quality	Polution detection capability assured	Prevents significant sewerage pollution	Acid-rain effects will be documented
Aquatic Biota	Minimal loses of aquatic species	Probable loss of numerous aquatic species both plants & animals	Status quo	Minimal losses of aquatic species	As above	Can be monitored in some waters
Basis for Litigation	Improved position for litigation	No basis for litigation	Improved position for litigation	Limited basis for litigation	(Not applicable)	Improved position for litigation

Alternatives F & G continued on next sheet

PROJECT STATEMENT TITLE: GLAC-N-009 WATER QUALITY MANAGEMENT

NEED FOR THE PROPOSAL: Glacier Park's aquatic ecosystem is threatened by numerous sources of potential damage from polution.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE F	ALTERNATIVE G
					Base line water quality study	Comprehensive water quality studies
Water Quality					Monitoring of some waters possible	Monitoring of many or all waters possible
Aquatic Biota					Can be monitored in some waters	Optimum monitoring potential
Basis for litigation					Generally not applicable - Basis for litigation in situation where damage is from external causes	Same as Alternative F

PROJECT STATEMENT TITLE: GLAC-N-010 AQUATIC ECOSYSTEMS MANAGEMENT

100.

NEED FOR THE PROPOSAL: Native aquatic biota subjected to stress through hybridization, competition, and predation by introduced species.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Alternative B Maintain active Aquatics Program. No action	NO PROGRAM A Alternative A No Program	ALTERNATIVE B Maintain active aquatics program. No action	ALTERNATIVE C Alternative C Reduced Aquatics program	ALTERNATIVE D	ALTERNATIVE E
Native Aquatic Biota	Optimum management of native species	Welfare of native species threatened	Selected alternative	Management effectiveness diminished		
Introduced Aquatic Biota	Reduced influence from exotic species	Genetic and ecological impacts on native species unchecked	Selected alternative	Maintenance of status quo		
Aquatic Habitat	Probable improvement	No improvement	Selected alternative	No improvement likely		
Aquatic Baseline Data	Continued expansion of data base	Data base frozen	Selected alternative	Minimal growth of aquatic data base		

PROJECT STATEMENT TITLE: GLAC-N-011 RIVER USE MANAGEMENT

NEED FOR THE PROPOSAL: Substantial stretches of the North, Middle and South Forks of the Flathead River system were added to the National Wild and Scenic River system in 1976. The west boundary of GNP is deliniated by the North and Middle Forks thus mandating special protection through NWSR designation.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternative C. Work with Forest Service Maintain high standard of Resource Mgmt.	Allow unlimited Recreational Use	Establish limits and standards independent of U.S. Forest Service.	Work with Forest Service. Maintain high standard of Resource Mgmt No Action		
VISITOR USE	Commercial use limited. Private use unlimited. High Quality Experience.	Unlimited use by commercial and private users. Quality of experience may be lessened by number of users.	Quality of experience would remain high.	Selected Alternative		
WATER QUALITY	Unaffected - High Standard	May be affected if large #'s of people use river.	Unaffected - would remain high standard.	Selected Alternative		
FISH/ WILDLIFE	Minimal Impact	Impact would increase as number or river users increased.	Minimal Impact	Selected Alternative		
VEGETATION/ SOIL	Minimal Impact by limited persons using river bank.	Impact would increase as #'s exceed carrying capacity.	Minimal Impact by limiting #'s of people using river bank.	Selected Alternative		

PROJECT STATEMENT TITLE: GLAC-N-012 EXOTIC PLANT MANAGEMENT

NEED FOR THE PROPOSAL: The presence of exotic plants is a problem in the maintenance of native plant communities and therefore their control is of primary importance.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternative D	Allow exotics to spread unchecked	Only document invasion of exotics. No Action.	Establish a herbicine program.	Develop a program of Bio control.	
VEGETATION/ SOILS	Native species would be enhanced.	Continued invasion of native species by exotics.	Continued invasion of native species by exotics.	Reduce exotics but have a negative impact on environment.	Selected Alternative	
FISH/ WILDLIFE	Some species may be affected.	Some species will be affected as exotics take over native plants.	Some species will be affected as exotics take over native plants.	Negative impact of fish and wildlife species.	Selected Alternative	
VISITOR USE	No impact	Aesthetic value may be reduced.	Aesthetic value may be reduced.	Not be impacted.	Selected Alternative	

PROJECT STATEMENT TITLE: GLAC-N-013 BALD EAGLE MANAGEMENT

NEED FOR THE PROPOSAL: A large number of Bald Eagles, an endangered species, stop over at GNP each Fall to feed on Kokanee salmon. These eagles are on their annual migration south.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternative C. Intensify Mgmt. activity to improve habitat and protection.	Assume that eagles will ultimately habituate to human intrusions.	Mgmt. that does not stimulate habitat improvement.	Intensify Mgmt. activity to improve habitat and protection.		
FISH/ WILDLIFE	Offers greatest amount of protection for both bald eagles and Grizzly bears.	Increased human disturbance would cause eagles to leave prematurely.	Does not adequately protect endangered species.	Selected Alternative		
VISITOR USE	Viewers confined to specific site but quality of viewing may be improved.	Due to disturbance eagles would leave area thus reducing number of visitors and quality viewing.	Quality of viewing would be negatively affected.	Selected Alternative.		

PROJECT STATEMENT TITLE: GLAC-N-014 MOUNTAIN GOAT MANAGMENT

A. Gunsight Pass - Sperry Glacier

NEED FOR THE PROPOSAL: There is an unnatural concentration of mountain goats in the Gunsight Pass -- Sperry Glacier area due to attractants that are man caused.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Alternative E. Reduce attractants and better inform visitors.	NO PROGRAM A Allow goat-human interaction with unnatural attractants	ALTERNATIVE B Continue with the unnatural concentration of goats. No Action.	ALTERNATIVE C Removal of goats.	ALTERNATIVE D Close area to people.	ALTERNATIVE E Reduce attractants and better inform visitors.
FISH/ WILDLIFE	Promotes a natural behavior in goats and reduces human-goat conflicts.	Promotes an unnatural behavior in goats Increased human-goat conflicts.	Unnatural concentration of goats occurring.	Removal of a native species is not consistent with park policy.	Goats would revert to natural behavioral patterns.	Selected Alternative
VISITOR USE	Reduction in human-goat conflicts. Visitor use may decline slightly.	Visitor use may increase due to the ease of viewing. Human-goat conflicts would increase.	Visitor use remains the same.	Visitor use would decrease.	No visitor use.	Selected Alternative

PROJECT STATEMENT TITLE: GLAC-N-014 MOUNTAIN GOAT MANAGEMENT

B. Walton Mineral Lick Area

NEED FOR THE PROPOSAL: A large number of Mountain Goats frequent the Walton Mineral Lick, To use the lick the goats must cross or pass under U.S. Hwy # 2 or cross the Middle Fork of the Flathead River.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternative C. Continue present Mgmt. plus effective Hwy signing.	Allow natural behavior among goats. Human disturbance & poaching may increase	Continue present Mgmt. Natural goat behavior, maintain viewpoint. No Action.	Continue present Mgmt. plus effective Hwy signing.		
FISH/ WILDLIFE	Allows natural behavior among goats.	Allows natural behavior among goats but may cause increased human conflicts and poaching.	Allows for natural behavior. Some disturbance due to illegal visitor use along Hwy #2.	Selected Alternative		
VISITOR USE	Some restrictions due to increased enforcement of "No Parking" on Hwy #2.	Visitor use would be unrestricted. Visitor complaints if viewing area closed.	Continued problems along Hwy #2.	Selected Alternative		

PROJECT STATEMENT TITLE: GLAC-N-015 WINTER USE MANAGEMENT

NEED FOR THE PROPOSAL: Winter use of the park is a popular activity for a number of visitors. Key attractions are photography, wildlife viewing and enjoyment of the winter landscape.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Alternative B. Allow use of the park for a majority of visitors.	NO PROGRAM A Permit use of unplowed roads for oversnow vehicles.	ALTERNATIVE B Allow use of the park for the majority of visitors. Continue policy of no snowmachines.	ALTERNATIVE C Maintain additional routes for winter vehicle travel.	ALTERNATIVE D Close the park to all winter use.	ALTERNATIVE E
VISITOR USE	Would allow for use of the park by majority of visitors while maintaining wilderness experience.	May cause conflict with other users, i.e. cross country skiers-snowshoers.	Selected Alternative	May show increase with increased viewing opportunities.	No Visitor Use.	
FISH/ WILDLIFE	Although some disturbance is caused it is kept to minimal levels.	May cause additional disturbance to wintering animals.	Selected Alternative	May cause additional disturbance to wintering wildlife.	No conflicts. Animal use of entire park without any disturbance.	
VEGETATION/ SOIL	Minor impact due to limited winter use.	No change	Selected Alternative	No Change	Would maintain true wilderness characteristics.	

PROJECT STATEMENT TITLE: GLAC-N-016 BIGHORN SHEEP MANAGEMENT

NEED FOR THE PROPOSAL: In recent years the Bighorn Sheep population in GNP has become subjected to unnatural influences (humans, autos, etc.) which has led to behavior modifications.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternative B. Educate visitors, enforce laws and when necessary use adverse conditioning.	Allow natural and unnatural behavior.	Educate visitors, enforce laws, and when necessary use adverse conditioning.	Increase National Park Service supervision.	Adopt sterner wording on signs and in handouts.	
FISH/ WILDLIFE	This alternative would promote natural behavior in the sheep which would reduce fatalities due to accidents and poaching.	Increase in sheep loss due to auto accidents and poaching.	Selected Alternative	Reduction in losses to auto accidents but poaching would remain problem.	May lead to a slight reduction in sheep mortality.	
VISITOR USE	Visitors can view sheep in natural environment and behavioral traits.	May be popular with some visitors who like to see "roadside beggars."	Selected Alternative	Visitor use would remain high but potential for sheep/people confrontations would also remain high.	May have a negative impact on visitor/NPS relations.	

PROJECT STATEMENT TITLE: GLAC-N-017 OTHER MAMMAL MANAGEMENT

NEED FOR THE PROPOSAL: Many species inhabit Glacier N.P. Although they are protected by law they are subject to human influences which may change their natural behavior. Poaching and auto accidents also contribute to mammal deaths each year.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternative B,C,D. Continue current Mgmt. Increase monitoring and consider feasability of Mountain Caribou.	Discontinue wildlife observations, patrols and census records.	Continue to monitor, patrol and keep census records of wildlife. No Action.	Consider feasibility of transplanting caribou.	Increase Monitoring Efforts.	
FISH/ WILDLIFE	Continue Current level of wildlife managment with an increased level of monitoring.	No wildlife management. Increased poaching and human influence on native species.	Selected Alternative	Selected Alternative	Selected Alternative	
VISITOR USE	Visitors not affected by this alternative. Would continue to view wildlife in natural habitat.	Increase human-wildlife conflicts.	Selected Alternative	Selected Alternative	Selected Alternative	

PROJECT STATEMENT TITLE: GLAC-N-018 FOREST INSECTS AND DISEASE MANAGEMENT

NEED FOR THE PROPOSAL: Pine Beetle infestation is highly visible and in developed areas does cause a hazard. This infestation is occurring under natural conditions and only those trees causing a hazard will be removed.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	No Action. Allow beetle populations to interact without human interferance.	Allow beetle population to interact without human interferance.	Carry out salvage cutting	Carry out insecticide spraying.	Apply Sevimol-4 chemical to selected trees.	
VEGETATION/ SOILS	Natural insect/ vegitation relationship preserved. Loss of trees through natural process.	Selected Alternative	Would have an adverse effect on native flora.	Adverse effect on flora.	May save selected trees but may have adverse environmental effects.	
VISITOR USE	Not aesthetically pleasing. May curtail visitor use.	Selected Alternative	Not aesthetically pleasing. May curtail visitor use.	Would be curtailed. No use while spraying.	No change.	
FISH/ WILDLIFE	Change in habitat will have a direct effect on wildlife composition.	Selected Alternative	Change in habitat will have a direct effect on wildlife composition.	Devastating effect on fish & wildlife.	May have severe impacts on fish/wildlife.	

PROJECT STATEMENT TITLE: GLAC-N-019 WOLVE MANAGEMENT

110.

NEED FOR THE PROPOSAL: The once abundant wolf is rarely seen in Glacier N.P. however, recent sightings indicate that a remanant population of wolves may still frequent the park.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	NO PROGRAM A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
	Alternative C. Intensify sightings and reporting efforts.	Discontinue support for wolf ecology program. Rely on outside info. only.	Provide modest support for research work.	Intensify sighting and reporting efforts. Work closely with wolf ecology team in gathering data.	Reintroduce Northern Rocky Mountain Wolf.	
FISH/ WILDLIFE	Would provide additional information about and protection of wolves and their habitat.	Would not support the parks mission of providing and protection.	Some improvement of wolf habitat may occur.	Selected Alternative	May cause adverse effect on exisiting wolf populations and stud necessary.	

PROJECT STATEMENT TITLE: GLAC-N-020 CAVE MANAGEMENT

111.

NEED FOR THE PROPOSAL: The caves in Glacier N.P, are unique, as they are the only known caves in the precambrian formation in montana.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Alternative D. Provide minimal physical protection. Do not publicize. Promote research.	NO PROGRAM A Allow use of caves without any restrictions.	ALTERNATIVE B Publicize location of caves and allow for use by interested visitors.	ALTERNATIVE C Install gates at entrances to all caves.	ALTERNATIVE D Provide minimal physical protection. Do not publicize, promote research.	ALTERNATIVE E
VISITOR USE	Minimal Visitor use.	Would cause life/safety problems.	May cause hazard and would add little, if any, to the park experience for the vast majority.	Would prevent unauthorized entry, but is not consistent with Park Resource Protection.	Selected Alternative	

Consultation and Coordination with Others:

This environmental assessment was drafted from distribution of the 1980 Glacier National Park "Resource Management Plan", and from subsequent updates of specific project statements within the Plan. A formal consultation/coordination procedure was not developed for the current Plan; however, subsequent updates and plans will include identification of all consultation and coordination.

General Maps within Glacier National Park

Lake McDonald region W/Interpretation. USNPS 1958 scale 1"= 0.5 miles (3 copies) (declassified)

Two Medicine Subdistrict Source? Date? Scale 1" = 2 miles (5 copies) (not classified)

Interpretation of Glacier National Park. USNPS 1958 scale 1"=1 mile (2 copies) (declassified)

Topo. map Glacier National Park USGS 1966 scale 1:125000 (2copies) (not classified)

Topo. map Glacier National Park and portions of Kootenai, Lewis and Clark, and Flathead National Forests. USDAFS and USNPS 1935 scale 1"=2 miles (7 copies) (3 declassified, 4 not classified)

Glacier View Dam display - Locational map (3 copies) sectional diagrams section A-B (1 copy) section C-D (1 copy) (not classified)

West Tunnel Cave; Map View; West-East Profile, West Tunnel Algal. Mapped by N. Campbell, J. Munthe, K. Munthe, S. Frye Sept. 1975 scale 1"=40' (2 copies) (not classified)

Pola Lake Cave: map view: West-East profile, North-South profile. Mapped by J. Munthe, J. Chester, J. Pollack, D. Osborn, R. Zuber. Aug. 1976 scale 1"=40' (2 copies) (not classified)

Zoo Cave map view South-North view map by J. Munthe, K. Munthe, J. Chester, R. Zuber Aug. 1976 scale 1"=40'

Aerial view Glacier National Park and Flathead Valley Photo. By Fred and Lucille Simpson 1954 (declassified)

Topo map - Glacier National Park USGS 1962 scale 1:125000 (Great Northern Railway) (not classified)

Topo. map Glacier National Park USGS 1962 scale 1:125000 (not classified)

Topo. map Glacier National Park USGS 1951 scale 1:125,000 (cat# 7219)

Topo. map - Sperry Glacier USGS USNPS taken from aerial photos taken in Sept. 1950 scale 1:4800 (20 copies) (3 declassfied, 17 not classified)

Topo. map - Sperry Glacier - USGS USNPS taken from aerial photos Sept. 1950 and 1960 scale 1:6,000 (7 copies) (not classified)

Topo. map - Sperry Glacier - USFS taken from aerial photo Sept. 1, 1950 compiled Jan. 1952 scale 1:8,000 1) Black Plate, (1); 2) Blue Plate (1) 3) Brown Plate (1); 4) Photocopies (2) (declassified)

Topo map - Sperry Glacier - National Park Service 1946 scale 1"-200'(2) 1"-500'(2) (1 declassified) (1 not classified)

Plan map Sperry Glacier USGS USNPS Date? scale 1:4800 (declassified)

Profile map Sperry Glacier USGS, USNPS 1950 (1938 profiles determined from a map by J.L. Dyson and are only approximate) Elevations based on assumed value of 7375 for Point A (declassified)

Ice front Sperry Glacier Source? Sept. 15, 1945, scale 1:4800 (declassified)

Identified points on Sperry Glacier, source and date ? Scale 1:4800 (declassified)

Elevations of Sperry Glacier. Surveyed G.R. Gibson and J.L. Dyson. 1938 scale 1"-200' - 1) Card Board (1), 2) Tracing paper (1), 3) Regular paper (1) (declassified)

Profile map Sperry Glacier. Source ? Date ? Printed on Graph paper (2 copies) (not classified)

Topo. map Sperry Glacier. J.L. Dyson and assistants surveyed in 1938 scale 1:9600 Black Print (not classified)

Topo. map Sperry Glacier. Charles R. Gajan, James L. Dyson, and George R. Gibson 1937 Cloth (cat# 7246)

Topo. map Sperry Glacier surveyed by James L. Dyson and DeWilton Smith 1946 scale 1"=200' Cloth (cat# 7283)

Topo. map Grinnel Glacier. USGS and USNPS taken from aerial photos taken in Sept, 1950, printed 1953. Scale 1-4800 (16 copies) (2 declassified) (15 not classified)

Topo. map Grinnel Glacier. USGS and USNPS taken from aerial photos taken Sept 1950 and Sept. 1960. Printed 1946. scale 1:6000 (3 copies) (1 declassified) (2 not classified)

Topo. map Grinnel Glacier. USNPS printed 1946. Scale 1"=200'. (5 copies) (4 declassified) (1 Cat# 7261); 1"=800 (1 copy) (not classified) ; 1"=500' (3 copies) (not classified)

Topo. map Grinnel Glacier, mapped by James Dyson 1946. scale 1"=200' (Cat # 7258)

Topo. map Grinnel Glacier, Source ? 1937 scale? (1 original, 1 Black print, 2 copies) (declassified)

Profile map Grinnel Glacier. Source ? Date ? Scale ? (not classified)

Identified points on Grinnel Glacier. USGS and USNPS Date ? scale 1"=400' (8 copies) (declassified)

Profile map Grinnel Glacier Profile No. 1 from Point B USGS and USNPS Date ? Scale ? (declassified)

Profile map Grinnel Glacier. Profile No. 2 from Point B USGS and USNPS. Date ? Scale ? (declassified)

Latitudinal Profile through station 1432 on profile No. 1 USGS and USNPS Date.? Scale ? (declassified)

Profile map Grinnel Glacier profiles from Point B USGS and USNPS 1956 (3 copies) (declassified)

Chart paper daily gage height, in feet and discharge in second feet of Grinnel Glacier. USGS Sept. 30, 1973 - Sept. 30 1974 (2 copies) (not classified)

Topo. map Jackson Glacier. James Dyson and assistants 1939. scale 1"=200' (declassified)

Topo. map Jackson Glacier Source ? 1939 scale 1"=200' (Cat #7225)

Topo. map Jackson Glacier USGS and USNPS 1950 scale 1:12,000 (declassified)

Ice front. (south three fourths) Grinnel Glacier, Sept. 12,1945 Scale 1:4800 (2 copies) (declassified)

Topo. map Grinnel Glacier, USFS 1950 scale 1:4000 (2 copies) (declassified)

Canadian Maps

Topo. Map Waterton Lakes Park C.M.T.S. 1928 scale 1:63360 (4 copies) (2 declassified, 2 not classified)

--------- Waterton Lakes Park CMTS 1958 scale 1:63360 (2 copies) (1 declassified) (1 not classified)

--------- Pincher Creek, Alberta CMTS. 1943 scale 1:50,000 (cat #7196)

--------- Glenwoodville, Alberta CMTS 1944 scale 1:50,000 (declassified)

--------- Moutain View, Alberta CMTS 1944 scale 1:63360 (declassified)

--------- Lethbridge, Alberta CMTS 1955 scale 1:250,000 (declassified)

--------- Fernie, B.C. - Alberta CMTS 1963 scale 1:250,000 (declassified)

--------- Cranbrook - Lethbridge B.C. - Alberta CMTS 1950 scale 1:500,000 (declassified)

--------- Beaver Mines, Alberta - B.C. CMTS 1960 scale 1:50,000 (2 copies) (declassified)

--------- Sage Creek, B.C. - Alberta CMTS 1960 scale 1:50,000 (4 copies) (declassified)

--------- Glacier Park, B.C. CMTS 1955 scale 1:126,720 (declassified)

--------- Lower Flathead (Kootenai District) B.C. CMTS 1959 scale 1:50,000 (2 copies) (declassified)

--------- Upper Flathead (Kootenai District) B.C. CMTS scale 1:50,000 (2 copies) (declassified)

--------- Cardston Alberta CMTS 1949 scale 1" = ½mile (folded in own folder) (not classified)

--------- Waterton Alberta CMTS 1952 scale 1:47,520 (folded in own folder) (not classified)

--------- Okangan - Kootenai B.C., Idaho, Washington CMTS 1955 scale 1:506,880 (not classified)

Aeronautical Edition Cranbrook - Leth Bridge B.C. Alberta CMTS 1961 scale 1:506,880 (not classified)

Trail Map - Park General, Glacier Park USNPS 1966 scale 1"=2 miles (2 copies) (not classified)

Trail Map - Hiking Trail map of Glacier National Park, Marshall Gingery and Keith Wilhelm 1962 scale 1"=1 mile Pamphlet scale 1"=3 miles (not classified)

Trail Map - St. Mary Trails. USNPS 1969 scale 1"=½ mile (17 copies) (not classified)

Trail Map - Glacier Park (overlay) source unknown, date unknown, scale unknown, (not classified)

Trail Map - Portions of Waterton Glacier Inter. Peace Park. source unknown, date unknown, scale 1"=1 mile (11 copies) (not classified)

Fort Assiniboine and St. Mary Lakes (Reconnaissance map drawn by Lt. Robertson in 1887) May want to be placed in Historical Museum #4453

International Boundary map of the 49th parallel between Montana, British Columbia and Alberta. Sheet No. 19 Publ. 1913 scale 1:62500 (2 copies) #7207 & 7174. Sheet no. 20 publ 1921 scale 1:62500 #7206.

Boundary proposal for Glacier National Park. Senate report 580, 60th Congress 1st. session no date. 2 photo copies #7162 & 7163

Surveyer General's map of a portion of Glacier National Park. Dated Nov. 1, 1894 Helena, MT. Transparency and a copy # none.

Glacier National Park Historical Base Map. Shows boundary surveys 1858, 1860, 1874, Indian Trails. Oil Exploration, townsites etc. Transparency (approx 1970) Also geological map of Glacier National Park. USNPS 1950 scale 1:125000 (attached to transparency) Declassfied.

Historical Map of Montana, Montana State Highway Dept. 1937 #7176

Topographical map of Glacier National Park USGS 1927 scale 1:125000 (shows place names as of Oct. 12, 1938.) #7170.

Topographical map of Glacier National Park USGS 1941 scale 1:125000 Burned areas 1910-1929 # none.

Topographical map of Glacier National Park USGS 1914 scale 1:125000 #7354

Topographical map of Glacier National Park USGS 1915 scale 1:125000 #9297

Topographical map. Kintla Lakes quadrangle USGS 1927. (declassified) scale 1:125000 also USGS 1938 # none.

Topographical map. Chief Mountain quadrangle USGS 1925. scale 1:125000

Topographical Map Browning quadrangle USGS 1921 scale 1:125000 #7295

Topographical map Nyack quadrangle USGS 1914 scale 1:125000 (declassified)

Topographical map Marias Pass quadrangle USGS 1913 scale 1:125000 (declassified)

Topographical map Browning quadrangle USGS 1903 scale 1:125000

Aero Plane map of Glacier National Park and Waterton Lakes Park. Great Northern Railroad Date ? 2 copies.

Master plan for Preservation and use of Glacier National Park USNPS 1961 (booklet) # none.

Columbia Falls Mt. townsite map. Drawn by P.S.A. Bickel, C.E. Helena MT. Date approx 1900 scale 1" = 400' # none.

Natural History Base Map. Ancient Glacial Erosion USNPS 1960 scale 1" = 2 miles (2 copies) (declassified)

---------- Biology. USNPS 1960 scale 1" = 2 miles (2 copies) (not classified)

---------- Physical Geology USNPS 1960 scale 1" = 2 miles (2copies) (not classified)

Topographic Base Map. USNPS 1957 Scale 1" = 2 miles (3 copies) (declassified)

Valier Quad. USGS 1937 scale 1:62500 (Glaciation) (declassified)

Lake Frances Quad. USGS 1936 scale 1:62500 (Glaciation) (declassified)

Heart Butte Quad. USGS 1918 scale 1:125000 (Glaciation) (declassified)

Blackfoot Quad. USGS 1911 scale 1:125000 (Glaciation) (declassified)

Cutbank Quad. USGS 1912 scale 1:12500 (Glaciation) (declassified)

Marias Pass Quad. USGS 1913 scale 1:125000 (Glaciation) (declassified)

Browning Quad. USGS 1903 ed. 1921 reprinted (Glaciation) (declassified)

Geological Map of Glacier National Park (very specific) USGS Date ? Scale ? (declassified)

Topo. Map Glacier National Park USGS 1941 scale 1:125000 (four environments if the park). (declassified)

Falls, Glaciers, Rivers, and Lakes of Glacier National Park (overlay) 16" x 21" Date and Source ? (not classified)

Vegetation type map. USNPS Date unknown but old scale 1" = 1.5 miles (not classified)

Topo. Map Glacier National Park USGS 1927 scale 1:125000 (Glaciation) (declassified)

Topo Base Map Glacier National Park USNPS 1939 scale 1" = 2 miles (2 copies) (Cat# 7151, 7152)

Top. Map GNP and Parts of Kootenai, Lewis and Clark, and Flathead National Forests USDAFS and USNPS 1935 scale 1" = 3 miles (fault lines) (Cat# 7240)

Rare II Final Environmental Statement, Northern Region National Forests Montana. USDAFS 1979 scale 1:1,000,000 (wilderness areas) (not classified)

Subsecton map of Western Montana. Bitterroot, Flathead, Kootenai, and Lolo National Forests USDAFS 1976 1:500,000 (subsection characteristics and interpretationa) (2 copies) (not classified)

Winter Range for fur-bearing animals; Martin and Beaver 1935 - 1936 portion of 1935 Topo. map of GNP, Kootenai, Lewis and Clark, and Flathead National Forests USDAFS and USNPS (2 copies)

Minimum Game Range 1935 - 1936 in GNP. Part of 1935 Topo. map of GNP, Kootenai, Lewis and Clark and Flathead National Forest (3 copies)

Winter Range for Fur Bearing Animals: Martin and Beaver 1936 - 1937 Topo. map of GNP, Kootenai, Lewis and Clark, and Flathead Nat. forest also section of the same map USDAFS and USNPS (3 copies)

Minimum Game Range 1937 - 1938. 1935 Topo. map of GNP, Kootenai, Lewis and Clark, and Flathead Nat. Forest. USDAFS and USNPS

Minimun Game Range 1934 - 1935 portion of Topo. Map of GNP source and date ?

Average Winter Range - Elk 1935 - 1939. Portion of 1935 Topo map of GNP, Kootenai, Lewis and Clark, and Flathead National Forests USDAFS and USNPS

Average Winter Range - Whitetail Deer 1935 - 1939. Portion of 1935 Topo. map of GNP, Kootenai, Lewis and Clark, andFlathead Nat. Forests. USDAFS and USNPS

Average Winter Range - Mule Deer. 1935 - 1939 Portion of 1935 Topo. map of GNP, Kootenai, Lewis and Clark, and Flathead Nat. forests. USDAFS and USNPS. (not classified)

Average Winter Range - Moose 1935 - 1939. Portion of 1935 Topo map of GNP, Kootenai, Lewis and Clark, and Flathead Nat. Forests. USDAFS and USNPS. (not Classified)

Average Winter Range - Bighorn Sheep 1935 - 1939. Portion of 1935 Topo. map of GNP, Kootenai, Lewis and Clark, and Flathead Nat. Forests USDAFS and USNPS (not classified)

Minimum Game Range 1936 - 1937. Portion of 1935 Topo. Map of GNP Kootenai, Lewis and Clark, and Flathead Nat. Forests. USDAFS and USNPS (4 copies) (not classified)

Winter Range of Moose and Elk mid 1930's Portion of 1935 Topo. map of GNP Kootenai, Lewis and Clark and Flathead Nat. Forests USDAFS and USNPS (not classified)

Winter Range of Whitetail and Mule Deer mid 1930's. Portion of 1935 Topo. map of GNP, Kootenai, Lewis and Clark, and Flathead Nat. Forests. USDAFS and USNPS (not classified)

Big Game Winter concentration areas 1937 - 1938 portion of 1935 Topo. map of GNP, Kootenai, Lewis and Clark and Flathead Nat. Forests. USDAFS and USNPS (not clasified)

Minimum winter Game concentration area 1938 - 1939. Portion of 1935 Topo. map of GNP, Kootenai, Lewis and Clark, and Flathead Nat. Forests. USDAFS and USNPS. (not classified)

Minimum game range for Whitetail Deer in GNP 1935 - 1936 hand drawn map (not Classified)

Minimum Game Range for Elk in GNP 1935 - 1936. Hand Drawn map (not classified)

Minimum Game Range for Moose in GNP 1935 - 1936. Ha..d drawn map (not classified)

Minimum Game Range for Black Tail Deer in GNP 1935 - 1936 hand drawn map. (not classified)

Minimum Game Refuge for Mt. Sheep in GNP 1935 - 1936 hand drawn map. (not classified)

Winter Range of Fur Bearing Animals in GNP 1936 - 1937. 1935 Topo map of GNP, Kootenai, Lewis and Clark, and Flathead National Forests. USDAFS and USNPS (2 copies) (not classified)

Game Lick Soil samples taken in 1947. 1935 Topo. map of GNP, Kootenai, Lewis and Clark, and Flathead Nat. Forests. USDAFS and USNPS (2 copies) (not classified)

North Fork - Flathead River fur survey map 1942 - 1943. Source ? (not classified)

Grizzly Bear reported sightings during 1965. Overlay C.R. Wasem, Dec. 1965. Descriptive sheet discussing sightings enclosed. (not classified)

Key Elk and Deer winter range location in Middle Fork Flathead River drainages, March 1967. Also helicopter flights over Middle Fork 1967. In 1941 USGS Topo. map of GNP. Scale 1:25000 (not classified)

Summer Elk Ranges in St. Mary, Red Eagle and Belly River Valleys. 1967 - 1968 In 1941 USGS Topo. map of GNP scale 1:25000 (not classified)

Soil zones of Alberta. Research council of Alberta 1967 scale 1"=50 miles (2 copies) (not classified)

Base map - Long Range Aquatil resources MGMT Plan 1967 - 1976 C. Robt. Wasem. 1968 scale 1"=2 miles (Paper loby and overlay) (not classified)

Hand tracings of lakes in Glacier National Park (5 sheets) (not classified)

Fish stocking map 1940 in Topo map GNP USGS 1936 Scale 1:125000 (not classified)

BASELINE INFORMATION

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