

FISHERIES MANAGEMENT PLAN
PICTURED ROCKS NATIONAL LAKESHORE
MICHIGAN

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NATIONAL PARK SERVICE
WATER RESOURCES DIVISION
FORT COLLINS, COLORADO
RESOURCE ROOM PROPERTY



FISHERIES MANAGEMENT PLAN
PICTURED ROCKS NATIONAL LAKESHORE
MICHIGAN

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INTRODUCTION

Background

Pictured Rocks National Lakeshore (PRNL) was authorized by an act of Congress in 1966. The lakeshore was formally established in 1972 "to preserve for the benefit, inspiration, education, recreational use, and enjoyment of the public a significant portion of the diminishing shoreline of the United States and its related geographic and scientific features" (P.L. 89-668). Approximately 71,000 acres are included within the boundaries of the lakeshore. Nearly one-half of the acreage (along 42 miles of Lake Superior) is established as a federally-owned "Shoreline Zone" intended to be managed for traditional national park purposes. The inland half of the park is intended to remain largely in State of Michigan and private ownership as an "Inland Buffer Zone" (IBZ). The IBZ is intended to provide protection for the Shoreline Zone portion of the Lake Superior watershed situated within the national lakeshore while still allowing for timber management and some development.

The park enabling legislation states "[t]he administration, protection, and development of the Pictured Rocks National Lakeshore shall be exercised by the Secretary, subject to the provisions of the Act of August 25, 1916" (the National Park Service Act) and specifically permits hunting and fishing "in accordance with the applicable laws of the United States and of Michigan". This plan is in compliance with federal legislation and National Park Service policy, and is intended to ensure federal/state cooperation for fisheries management in the national lakeshore.

Pictured Rocks National Lakeshore contains numerous lakes, rivers, and streams within its boundary. Many of these are contained wholly or partially within the Shoreline Zone. This plan addresses only those Shoreline Zone waters or those waters on federally-owned lands within the IBZ.

The waters of PRNL are considered relatively sterile and unproductive in terms of sustaining large biomasses of fish and associated communities. They do offer opportunities for production of native game fish, as well as spawning streams for anadromous natives and non-natives from Lake Superior, supplying a limited amount of fish for angler consumption. Gamefish species native to the area include largemouth bass, smallmouth bass, northern pike and walleye; yellow perch, rock bass, lake whitefish and menominee





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are other commonly found native species. Typical native trout species found are brook trout and lake trout. Non-native, naturalized (self-reproducing) game species include Pacific salmon species (steelhead, coho and chinook) and smelt. Splake is a non-reproducing trout hybrid that in the past has been stocked within the lakeshore.

Goals and Objectives of Fisheries Management at PRNL

The goals of fisheries management at Pictured Rocks are:

- * To manage the park's resources in an integrated manner that will protect, restore and conserve fishery resources.
- * To provide diverse and quality recreational fishing opportunities emphasizing native species in their natural habitats.
- * To coordinate fisheries management between the NPS and other federal agencies and the Michigan Department of Natural Resources.

Objectives:

- 1) All fisheries management actions will be based on sound research and principles of ecosystem management.
- 2) Management of waters in the Shoreline Zone will emphasize native fish populations and communities that are balanced and self-sustaining. Fish stocking might be prescribed in some waters to facilitate the re-establishment of native species to self-sustaining levels of abundance.
- 3) The National Park Service (NPS) will cooperate with Michigan Department of Natural Resources (DNR), the US Fish and Wildlife Service (FWS), and the National Biological Service (NBS) to gain needed information on game and non-game fish species and aquatic communities.
- 4) A quality recreational fishing experience, related to native species present in self-sustaining populations, will be provided where possible. A quality experience includes catch-and-release fishing where appropriate.
- 5) Management will focus on preservation and restoration of aquatic habitats present prior to European settlement.



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- 6) Fisheries management will be fully integrated with other resource management activities.

History of Fisheries Management at PRNL

Prior to establishment of the park, the Michigan Department of Conservation conducted fisheries management activities on many of the inland lakes now within park boundaries. The focus of these activities was on game fish species, with the goal of improving fishing opportunities through stocking, habitat manipulation, catch limits and rough species removal. Little is known about what species were found in these lakes prior to any management, and there is limited documentation of early management activities.

Fisheries management activities have continued to be carried out by the Michigan Department of Natural Resources (DNR). In 1983 the park service and the DNR were signatories to a cooperative fisheries management plan that identified fisheries management prescriptions and practices appropriate to park waters. In 1987 and 1988 arctic grayling were planted in some park waters in an effort to restore to the Upper Peninsula an extirpated species.

A majority of the fishery surveys and evaluations within PRNL have been conducted since the 1970's by personnel from the DNR, utilizing various netting and electro-fishing gear. Fish collected were identified, measured, weighed, scale samples taken, and cursory inspections made for parasites and diseases. In addition, some limnological sampling (temperature profiles, alkalinities, pH, etc.) has been conducted on larger lakes by both DNR personnel and NPS contractors and cooperators (Kamke, 1987; Lewin, 1991; Limnetics, 1970; Stottlemeyer, undated).

PRNL Fisheries Management Today

Recent changes in public attitudes and legal mandates, and advances in the understanding of ecosystems, challenge resource managers to reexamine management philosophy and policies.

The National Environmental Policy Act of 1969 requires the federal government to fully consider the environmental impacts of agency actions in all management decisions. The Endangered Species Act of 1973 mandates the protection of all species, regardless of their economic value. At the state level, Michigan has an endangered species act that protects threatened and endangered populations within the state. The Michigan Biological Diversity Conservation Act of 1992 gives official recognition to the importance of



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protecting the diversity of Michigan's natural resources and directs the legislature to set a strategy for doing it.

Policies for resource management on national park lands, and more specifically fisheries management, have been refined in recent years. Regarding recreational fishing in national parks, NPS Management Policies (1988) state:

Recreational fishing will be allowed in parks where it is authorized by federal law or where it is not specifically prohibited and does not interfere with the functions of natural aquatic ecosystems or riparian zones.

Virtually all of the waters within the Shoreline Zone are located within designated "natural zones" in the park's General Management Plan (1981). According to NPS Management Policies:

In natural, cultural, and park development zones, fisheries management will seek to preserve or restore natural aquatic habitats and the natural abundance and distribution of native aquatic species, including fish, together with the associated terrestrial habitats and species. (USDI, 1988)

According to park service guidelines for natural resources management, NPS-77:

This policy means that superintendents should strive to preserve or restore the natural behavior, diversity, and ecological integrity of fish populations in fulfilling their fishery management responsibilities. Managers should also give strong consideration to protection of non-fish aquatic species under this policy. Naturally fish-free waters should not be considered "barren". Their assemblages of aquatic insects, amphibians, and plankton can be significantly altered by the introduction of fish...superintendents should recognize the potential for adversely impacting other park fish and wildlife. (USDI, 1991)

These laws and policies, plus the increased awareness of the need to view resources as interrelated ecosystems, has led government agencies and private land managers toward more cooperation and integrated resource management focused at the ecosystem level. Perhaps the best evidence of this trend in the Upper Peninsula is the Ecosystem Management Group initiated by the US Forest Service



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and the Michigan DNR. This group seeks to bring state, federal, and private land managers together to cooperate on common management strategies for the benefit of all.

This plan is consistent with these legal and policy mandates, and the principles of scientific management, by looking at fisheries within the context of the ecosystems within which they reside.

Research Needs

There is a real need for more science-based management of Pictured Rocks aquatic systems. Essential baseline data is lacking. The Pictured Rocks waters, like most of the rest of the U.P., have been altered in various ways without regard to unintended, long-term impacts, and prior to any assessment of what was here. Virtually nothing is known about the fisheries prior to European settlement and logging.

In addition, research must be focused at the ecosystem level. Information from the study of various ecosystem components needs to be integrated with fisheries data to produce a fisheries management program consistent with the overall goals for park resource management.

Within this context, the following research needs are identified:

- 1) **Historic Information.** Information about the area's aquatic systems prior to European settlement and subsequent alterations to the environment (primarily logging) is lacking. Examination of historic journals, surveyor notes, etc., may provide some of this information. Core sampling of lake bottoms may also be useful. This information is needed to provide managers a sketch of what was the natural state in order to carry out restoration activities where needed. Recent research on Hiawatha National Forest (Benchley et al., 1993) seems to contradict the accepted belief that logging caused "greatly increased" sand deposition in area rivers. Thorough study is needed to determine what is true for PRL waters. One place in need of study is Beaver Lake, which may have supported a walleye population prior to logging activities. Logging and related water level manipulation may have caused significant sand deposition.
- 2) **Limnological Surveys.** Information on the physical, chemical and biological characteristics of the park's lakes and streams is needed. Kamke (1987) developed a database for four major





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lakes: Miners, Chapel, Beaver and Grand Sable. Data for such aspects as temperature, dissolved oxygen, nutrients, plankton, alkalinity, carbon dioxide, phosphorus, heavy metals, and aquatic macrophytes were obtained for those lakes and is needed for other lakes and streams as a baseline.

- 3) **Habitat Analyses.** Streams and lakes need to be examined to determine habitat suitability for self-sustaining populations of native species. Information from limnological surveys will provide much of the basis for these analyses.
- 4) **Survey of Aquatic Mammals and Birds.** Population surveys for aquatic-based birds and mammals are needed. In particular, a comprehensive study of bald eagle feeding habits in the Beaver Lakes and Grand Sable Lake is needed to assist managers in developing appropriate fisheries management strategies for these waters.
- 5) **Fish Population Surveys.** A parkwide baseline fish survey is needed for all waters. Following that, surveys of lakes should be routinely carried out at least every ten years to track species composition, age structure, relative abundance and community balance.
- 6) **Social Science Surveys.** Surveys of fishermen are needed to gain better information on numbers of users, catch, attitudes and satisfaction.

Most of this information is basic baseline data needed to build the foundation for more complex analysis. Risk assessment for the ecological impacts of upper watershed land uses is one such analysis that is a high priority for the park. The park obtained funding, beginning in 1994, for a three-year study of its aquatic systems. This study will gain needed baseline data for physical, chemical and biological characteristics of lakes and streams, establish a monitoring system for key components and watersheds, and attempt to create models for predicting impacts from potential near-park land uses. This study will significantly add to the knowledge base for Pictured Rocks' aquatic systems. The National Park Service and the National Biological Service will work to involve the US Fish and Wildlife Service and the Michigan DNR in accomplishing the goals of this project.

For the lakes with histories of fishery management, detailed research plans should be developed to guide investigations to meet management needs. These plans should identify specific questions



to be answered by research and the potential projects to address those questions. The plans should prescribe the means to meet research needs identified in 1 through 6 above for each specific lake or stream. Expertise from NPS, DNR, the National Biological Service, and the US Fish and Wildlife Service should be utilized to develop these research plans.

SURVEY SUMMARIES AND MANAGEMENT PRESCRIPTIONS

Grand Sable Lake (T49N, R14W, Sections 10, 11, 14, 15, 22)

Kamke (1987) described Grand Sable Lake as a glacial kettle lake with a surface area of 306.6 ha and a mean depth of 9.7 m. He considered the lake to be a typical northern temperate lake.

Managed as a "two story" trout and coolwater fishery since 1937, this 630 acre lake has been stocked annually with lake trout and/or splake. Netting efforts in recent years turned up relatively large individual northern pike, lake trout, and smallmouth bass. Yellow perch and rock bass are the predominate panfish species, offering only mediocre angling.

White suckers are numerous and certainly compete with panfish for available insect production. A manual removal was accomplished in 1985, removing 4315 lbs. of suckers.

Smelt are an important forage species for trout. Spawning runs were documented during May 1980 in three major tributaries (Towes, DeMull, and Rhody Creeks). Only Towes Creek is open to dipping with hand nets, April 1 through May 31 annually.

Sable Lake is within a known historic bald eagle nest territory. For the past few years eagles have been frequently seen feeding in the lake, and in 1994 successful nesting was confirmed.

The lake is netted annually to obtain lake trout for the DNR Surface Water Quality's ongoing fish contaminant studies. The lake is a "control" to follow atmospheric contamination. In 1987 80 percent of the large trout sampled were contaminated above the .5 ppm trigger level (limited consumption warnings) for mercury. Data for 1991 show no fish sampled were found to exceed the trigger level, but all fish in the sample were less than 22 inches in length--indicating the trigger level is exceeded only in upper age classes. In 1993 seven lake trout were sampled, all in the 5 to 7



year age classes. All were 22 inches or less in length, and three exceeded the .5 ppm trigger level (Michigan DNR, 1994).

Management Prescriptions: A thorough study of this lake is needed to gain baseline information on the entire limnological community and to determine the lake's capability to support a self-sustaining lake trout population. Stocking of lake trout will be conducted with the goal of establishing a naturally-reproducing population. Monitoring will be conducted to determine the success of the stocking. After ten years of monitoring the stocking program will be re-evaluated in order to determine if the program should be continued or eliminated. White sucker numbers should be monitored to determine their impact on fish community balance. Smelt forage levels should be periodically monitored. Year-round fishing should be continued.

A research plan for this lake should be developed to identify investigations needed to better understand the lake's aquatic communities. Included in the plan should be habitat analysis and determination of reproductive success of lake trout, both in the lake and in three streams flowing into the lake ecosystem.

Due to the presence of eagles on the lake, NEPA compliance, including consultation with the U.S. Fish and Wildlife Service in accordance with the Endangered Species Act, will be completed prior to approval of any management actions with potential to significantly impact the ecosystem.

Sable Creek (Mouth: T49N, R14W, Section 2)

This stream is the outflow from Sable Lake to Lake Superior. Its major fisheries potential rests with its ability to sustain anadromous trout and salmon below Sable Falls. The 0.3 miles of the creek below Sable Falls affords excellent spawning gravel and flow for coho, pink, and chinook salmon and rainbow trout. A good menominee fishery is available seasonally in Lake Superior at the mouth.

Above the falls the stream and its fish population is influenced by warm water temperature developed from surface spillage from Grand Sable Lake. Its fishery is typified by minnows (creek chub, bluntnose, and mottled sculpin) and small rock bass. Some erosion from steep sandy banks occurs in Section 11, but it does not appear to be seriously affecting fisheries values.



Management Prescriptions: Management of Sable Creek below Sable Falls will emphasize recreational fishing opportunities for anadromous trout and salmon. In order to provide for optimal recreational fishing opportunities, sportfishing regulations will provide for an extended spring and fall fishing.

Hurricane River (Mouth: T49N, R15W, Section 25)

Originating from spring ponds in Sections 31 and 36, the Hurricane River drains about 10 square miles and flows northerly to Lake Superior through sand and sandstone ridges. About 60 percent of its 9 miles of mainstream is open to the public through NPS and Benson Forest Products ownership.

The Hurricane River provides good steelhead and coho salmon angling seasonally below County Road H-58, some brook trout angling in its headwater beaver ponds/springs and a menominee fishery off the mouth in Lake Superior. A series of beaver dams and extensive sand deposits may be degrading the river in Section 14. Anadromous species, however, are able to negotiate these dams as numerous coho smolts were observed above the dams in September 1982.

Management Prescriptions: The Hurricane River will be managed as follows: (1) on state-owned lands in Section 14, consider construction of a sediment trap to prevent sand/silt, presently held behind beaver dams, from moving downstream and burying valuable habitat; (2) continue brook trout and steelhead management featuring natural reproduction; (3) keep the lower Hurricane River open for extended spring fishing up to County Road H-58; and (4) continue pink salmon abundance monitoring. No pinks were observed in September 1980, but strong runs were reported in 1977 and 1979.

Sullivan Creek (Mouth: T49N, R15W, Section 9)

This trout stream (10-foot average width) provides fair to good brook trout angling. Menominee and steelhead are caught seasonally off the mouth.

Management Prescriptions: Management for brook trout under statewide fishing regulations will continue. Study of the impacts of logging on stream bed sediments and debris buildup should be conducted.



Sevenmile Creek (Mouth: T49N, R16W, Section 25)

This stream drains from two small lakes in the eastern side of the Beaver Basin. Surveys indicate that brook trout predominate throughout most of the stream and steelhead runs and reproduction occur in selected gravel reaches. Recently an angler reported finding juvenile lake trout in these waters.

Management Prescriptions: Brook trout and steelhead management, featuring emphasis on natural reproduction, will continue. No significant habitat problems were noted in 1980. A thorough survey is needed and a water quality monitoring program should be established to track inputs from upper watershed logging on state and private lands.

Sevenmile and Hyde Lakes (T48N, R16W, Section 11)

No survey work has been done on these small lakes, although there is some fishing activity known, notably brook trout in Sevenmile Lake.

Management Prescriptions: A complete survey and habitat assessment should be done on these lakes.

Arsenault, Bills, and Little Beaver Creeks (Mouths: T48N, R16W and R17W, Sections 13 and 18)

All are relatively short, trout quality tributaries of Little Beaver Lake. Brook trout (3.5 to 6 inches) is the predominant species found in all three.

Management Prescriptions: (1) All of these stream courses will be managed for a self-sustaining trout fishery under statewide fishing rules, and (2) Monitoring will be initiated to determine the extent and impacts of erosion.

Little Beaver Lake (T48N, R16W and R17W, Sections 13 and 18)

Little Beaver Lake is a 5.7 ha lake that drains into Beaver Lake. It is characterized by high populations of white suckers and bullheads. Yellow perch and rock bass are present but most are small. Large (up to 20 pounds) northern pike are present. Smallmouth bass are relatively scarce, probably due to low oxygen



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values and competition. There may be some movement of walleye from Beaver Lake. Manual removal of suckers (881 lbs.) and bullheads (86 lbs.) was carried out in 1983. A survey in 1986 found no smallmouth bass; the rest of the piscine community was found to be similar to previous surveys.

A pair of bald eagles have nested along the south shore of Beaver Lake since 1989, producing fledglings almost every year.

Management Prescriptions: This lake will be managed for existing species. Further control of white sucker and bullhead populations will be considered only after thorough assessment of habitat needs of nesting bald eagles. Management actions will require NEPA compliance and Section 7 consultation with FWS under the Endangered Species Act. Little Beaver Lake should be included in the Beaver Lake research plan.

Beaver Lake (T48N, R16W, Sections 7, 8, 9, 17, and 18)

Beaver Lake is a 308 ha oval-shaped lake with a mean depth of 6.8 m (Kamke, 1987). It is subject to considerable wave action from prevailing northwest winds. A prominent feature of this lake is a large sand shelf extending 55-60 m from shore. Loope (1993) documented possible impacts from a logging dam on the Beaver Creek outlet that resulted in significantly altered water levels.

Like Little Beaver Lake, Beaver Lake has a reputation for producing trophy-sized northern pike. Fish in the 12-17 pound class are taken regularly by spring trollers. In addition, Beaver Lake supports walleye, smallmouth bass, rainbow trout (transients from Lake Superior), smelt, yellow perch, carp, white and long nose sucker, and burbot. Netting in 1988 and boomshocking in 1993 indicated a slow growing perch population consisting of small individual size fish, but were inconclusive for walleye.

The earliest surveys of this lake, in 1953, did not indicate any walleye present. Later surveys in 1984 found ten year old walleye, however, stocking was not begun until 1983. These walleye found in the survey were either missed in earlier surveys or migrated in from Lake Superior.

The changes brought about by logging activities may have buried gravel beds that historically supported walleye reproduction. Shoal areas on this lake are barren sand flats, with the exception of a few scattered weedy areas along the northeast and east



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shorelines. Fish cover is scarce. There is limited smallmouth bass and walleye spawning rubble on the southeast shoreline. In the past DNR stocked splake, but relatively few were caught. Walleye fry plants from 1982-84 yielded poor survival. However, 1994 boom-shocking showed high survival of 1993-stocked fingerlings. Surveys in 1994 indicated some natural reproduction, but more data is needed to determine whether natural reproduction alone can sustain the fishery.

Management Prescriptions: Management will be targeted for existing walleye, northern pike, smallmouth bass, and yellow perch, pending more thorough study of the lake habitat. Because of the relatively shallow nature of the basin, trout management other than for transient trout and salmon (headed up Lowney Creek) is considered unproductive. Limnological work done during August 1981 supports this management. Very little summer salmonid habitat (cool oxygenated water) is present.

Study of the impacts of sand deposition from logging activities (in particular the dam on Beaver Creek) is needed to determine what habitat existed prior to anthropogenic change. Core samples should be taken around the shoal areas of Beaver Lake to determine if significant gravel areas were covered by sand. If it can be determined that possible walleye spawning areas have been altered by human activities, restoration of these gravel beds and stocking to establish a naturally reproducing, self-sustaining walleye population will be considered. Alternate year stocking will begin in 1996 and last until 2000, when a survey will be conducted to determine representation of naturally spawned walleyes in the population. Re-evaluation of management for this lake will take place at that time.

Planting fall fingerlings should provide higher survival in attempts to establish a sufficient size brood stock to create stability in the present fishery. Since a few naturally-produced walleye were observed in 1980, it is believed fingerlings should have a reasonable chance of expanding the presently low adult populations and adding more stability (balance) to the present fishery.

As discussed in the Little Beaver Lake narrative, management of Beaver Lake must take into account the active bald eagle nesting territory. NEPA and Endangered Species Act compliance will be completed in conjunction with development of management strategies.



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A complete research plan should be developed for the Beaver Lakes to identify the investigations needed to provide needed information to build a long-term management strategy.

Lowney Creek and pond system (Mouth: T48N, R16W, Section 17)

Lowney Creek drains into Beaver Lake. A private company which had a resort on the shore of Beaver Lake created several ponds by installing low-head dams on the upper reaches of this system. These dams are mostly still in place and have largely been incorporated into beaver dams.

The creek system is composed of the Burrell, Hemlock, East Branch, and West Branch; it is relatively cool with water temperatures generally 55°F or less during late June. It possesses a high gradient, provides excellent salmonid spawning habitat, and is populated with small brook trout and rainbow trout. Cover for larger fish is generally lacking, and growth conditions are restricted by cool water temperatures.

Larger trout are found in the six man-made ponds and behind occasional beaver dams within the system. The man-made dams serve to block sea lamprey adults migrating into the system from Lake Superior through Beaver Creek and Beaver Lake to spawn. Lamprey ammocetes were discovered in the creek in 1985. If lamprey become established in the upper Lowney watershed, various means of control will have to be assessed. The U.S. Fish and Wildlife Service has the lead in Great Lakes lamprey control and regularly surveys this system.

Management Prescriptions: The six man-made dams will be retained and a natural trout fishery will be managed under statewide fishing rules. Apparently sufficient trout reproduction occurs in headwater springs and stream sections above the ponds to sustain the fishery.

Trappers Lake (T48N, R16W, Section 4)

Also located in the Beaver Basin, the fish population of Trappers Lake was first surveyed in June 1980. Only rock bass and yellow perch were found. Perch averaged 7.7 inches and were nearly 40 percent catchable (i.e., 40 percent of the sample were 8 inches or longer in length). Largemouth bass were stocked in 1983 and 1984. Netting in 1985 found no largemouth bass in the lake and stocking



was discontinued. However, largemouth bass are known to have an aversion to nets, and they may have been able to avoid survey.

Excellent fish cover was found in the form of submerged weed beds and cedar snags along the shoreline.

Management Prescriptions: This lake will be managed for walk-in fishing for extant species. A hook-and-line survey is needed to determine the status of largemouth bass. A comprehensive research plan is needed for this lake.

Spray Creek (Mouth: T48N, R17W, Section 15)

This creek drains the area between Chapel and Beaver watersheds into Lake Superior.

Mud minnows, red belly dace and brook trout dominate the fish fauna of this small drainage. Two different strains of the arctic grayling were introduced into the creek in 1987 and 1988 after chemical treatment with rotenone. This effort to reestablish an extirpated species has apparently failed. Backpack shocking of the stream in the late summer of 1988 turned up only small brook trout.

Management Prescriptions: Original (pre-treatment) fish fauna has apparently repopulated the stream. A survey to determine species present and populations should be conducted. Management will be for the species present, featuring brook trout.

Legion Lake (T48N, R16W, Section 30)

Legion Lake was described by Lewin (1991) as "a small seepage lake (14 ha) in a small watershed (72 ha)". Lewin's research showed Legion Lake to be a highly sensitive clear water lake with low alkalinity and a pH of around 4.8. Core samples indicate a low pH dating back several centuries, and Lewin suggests that anthropogenic acid deposition has not had a significant effect on the lake's pH.

Anglers have reported catching bluegills in this lake as far back as 1958, but these were possibly stocked by local residents some time prior to that date. A 1966 DNR survey found bluegill and northern pike to be present. Brook trout were stocked between 1947 and 1951. The lake was chemically treated in 1967, then managed primarily for splake from 1968 until 1982. Rainbow trout were



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substituted for splake in 1979 and 1980, but September 1980 netting indicated only splake survived. Return to brook trout management occurred in 1983 with annual stocking for "put and take" fishing. Stocking was suspended during the acid deposition studies in the late 1980's. Other fish present include yellow perch and minnow species; these species may have been historically present.

Management Prescriptions: The low pH of this lake is an important factor in preventing successful brook trout reproduction. Its location at the top of the divide between Lake Superior and Lake Michigan watersheds and resultant situation of being supplied only by precipitation makes it useful as a location for study of anthropogenic acid deposition. In light of this fact stocking of brook trout has been discontinued. A research plan directed at developing investigations to address future management prescriptions is needed. Future fisheries management could consider managing for bluegill, northern pike, yellow perch and minnows, based on findings of a history of these species inhabiting and reproducing in this lake.

Chapel Lake (T48N, R17W, Sections 21, 28, and 29)

Chapel Lake is an elongate, deep lake with two basins set in a steep watershed. Kamke (1987) guessed the deeper south basin (44 m max.) to have been a plunge pool in an ancient glacial channel.

A 1988 survey of the lake found populations of yellow perch and northern pike with good growth rates. The present fishery consists of relatively large pike (23 inch average), yellow perch, and rock bass with a white sucker forage base. While this lake is not known to be heavily fished, it is popular with a small group of anglers who are willing to hike.

Management Prescriptions: Chapel Lake will be managed for the species present, with continued monitoring to detect any changes in aquatic biota from upstream logging or other causes.

Little Chapel Lake (T48N, R17W, Sections 20 and 21)

This small lake is just north of Chapel Lake. First surveyed in June 1981, this lake's fishery closely resembles that of Chapel Lake with northern pike and yellow perch present. Habitat conditions in the lake appear adequate for the species present;



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adequate pike and perch spawning habitat occurs near the two permanent inlets on the west shore.

Management Prescriptions: Management for the species present will continue. They can be readily taken by backpacker anglers.

Section 34 Creek (Mouth: T48N, R17W, Section 28)

Forming Chapel Falls where it cascades about 50 feet off the escarpment into Chapel Lake, this stream contains only brook trout and an occasional mud minnow per July-August 1980 and 1981 electro-fishing checks. Some brook trout angling is reported behind beaver dams in its headwaters in Sections 33 and 34, but generally the fish are small and the stream receives only light fishing pressure.

This small stream was identified as suitable for trial planting with arctic grayling (see discussion on Spray Creek above). Two different strains of the arctic grayling were introduced into the creek in 1987 and 1988 after chemical treatment with Rotenone. This effort to reestablish an extirpated species has apparently failed. Backpack shocking of the stream in the late summer of 1988 turned up only small brook trout.

Management Prescriptions: The stream will be managed for naturally reproducing populations of extant species, primarily brook trout. A survey and monitoring of the stream is needed to track their status since the grayling re-introduction and stream treatment. Should it be determined that brook trout have not been able to reestablish since the treatment, restocking will be considered.

Chapel Creek (Mouth: T48N, R17W, Section 29)

In the recent past, DNR personnel suspected that Chapel Creek suffered from severe erosion and sedimentation problems due to logging activities. Erosion from the access road to the Chapel/Mosquito trailhead is another likely source of sediments. The NPS conducted a survey of physical properties of the stream banks and bed in the summer of 1986 (Loope and Holman, 1991). Findings indicate that stable banks and gravel and cobble bottom are characteristic of the stream above the foot bridge in Section 32 just north of the Chapel parking lot.

A July 1980 check of the fish populations revealed small brook trout, mottled sculpin, and 5-spined sticklebacks.



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Management Prescriptions: This stream will be managed for naturally reproducing brook trout under statewide regulations. Further study should be conducted of the impacts of the access road and logging in the Chapel area.

Mosquito River (Mouth: T48N, R18W, Section 25)

The Mosquito drains a large portion of the western portion of the park. In July 1980, the fisher population was checked with electro-fishing and fishing gear in Section 8 above County Road 639. It revealed a good brook trout fishery behind beaver dams, in spite of a 76°F water temperature reading taken in June 1956 by a DNR research biologist. Air and water temperatures taken in July 1980 were 66°F and 57°F, respectively.

PRNL rangers reported fairly heavy steelhead usage in 1981, with most spawning observed close to the base of Mosquito Falls in Section 31. The steelhead run in recent years seems to have declined. Further electro-fishing should be conducted in Sections 25 (T48N, R18W), and 30 and 31 (T48N, R17W) to evaluate steelhead reproduction which sustains this run.

Management Prescriptions: The stream above Mosquito Falls will be managed for naturally reproducing brook trout and the area below the falls for steelhead, under statewide regulations. A planned road closure to the west side of the falls area should reduce illegal fishing activities observed here in the past. This situation should continue to be monitored by DNR and PRNL personnel.

Miners River and Lake (Mouth: T47N, R18W, Section 3)

The Miners River above the falls (Section 15) is typical of most PRNL trout streams; it is fast, shallow, rocky, contains relatively sparse cover for large trout, and is too cold to promote good brook trout growth. Below the Miners Beach Road, the stream experiences erosion and siltation problems from unstable sand banks, 6-25 feet high. The only spawning gravel available to anadromous fish below the falls occur in a 400-foot section near the mouth, a 100-foot reach immediately below the DNR lamprey weir, and again in the 0.25 mile reach between Miners Lake and falls. These areas are used extensively by steelhead and coho salmon. Pink salmon use the gravel near the mouth almost exclusively.



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The upper river contains a fairly sizeable population of brook trout as evidenced by July 1980 collections above County Road 637; however, 1980 work near County Road H-58 showed few trout attain legal size.

In September 1980, about 400 pink salmon were observed spawning in the mouth area, most below the first low falls near the river's mouth. This indicates an even year build-up of two year old fish from this system.

Miners Lake, a wide spot in the river about 0.25 miles below Miners Falls, contained northern pike and white sucker during July 1980, the same species mix documented in 1966 netting. One brook trout was also observed in 1980, probably taking up residence from the river above.

Management Prescriptions: The river reach above the falls will be managed for naturally reproducing brook trout, and the lower river managed for the present species mix of anadromous steelhead and limited pike fishery in Miners Lake. Follow-up surveys of the entire system should be conducted. If determined to be human-induced erosion, the unstable sand banks below the Miners Beach Road may be considered for stabilization.

Two unnamed creeks (Mouths: T47N, R18W, Sections 17 and 20)

These creeks were checked at Carmody Road in Sections 28 and 29, T47N, R18W, in July 1980 and November 1981. Both appear intermittent and debris choked. Stream water temperatures where they crossed Carmody Road were 72°F and 76°F in Sections 29 and 28, respectively, in July 1980. Air temperature the same day ranged from 60-68°F.

A 1981 check downstream revealed no anadromous activity. In November 1981, the stream in Section 17 was dry. Only about 0.5 cfs flow was detected in the creek in Section 20 on the same date. Because of their intermittent nature, these creeks are judged to have very low management potential.

Management Prescriptions: These streams will be periodically monitored to detect any changes in aquatic species.



Sand Point Ponds (T47N, R18W, Sections 19 and 30)

PRNL personnel report that these ponds contain perch. Dissolved oxygen checks were conducted during March 1981; oxygen levels to support fish life were found to be marginal. Also, the ponds are very shallow. Most have maximum depths less than two feet, further limiting their fisheries potential.

Management Prescriptions: Thorough surveys of these ponds are needed to establish baselines for limnological characteristics and aquatic species populations. Monitoring of these ponds is needed to track trends.

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