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1200 Sixth Avenue
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Alaska
Idaho
Oregon
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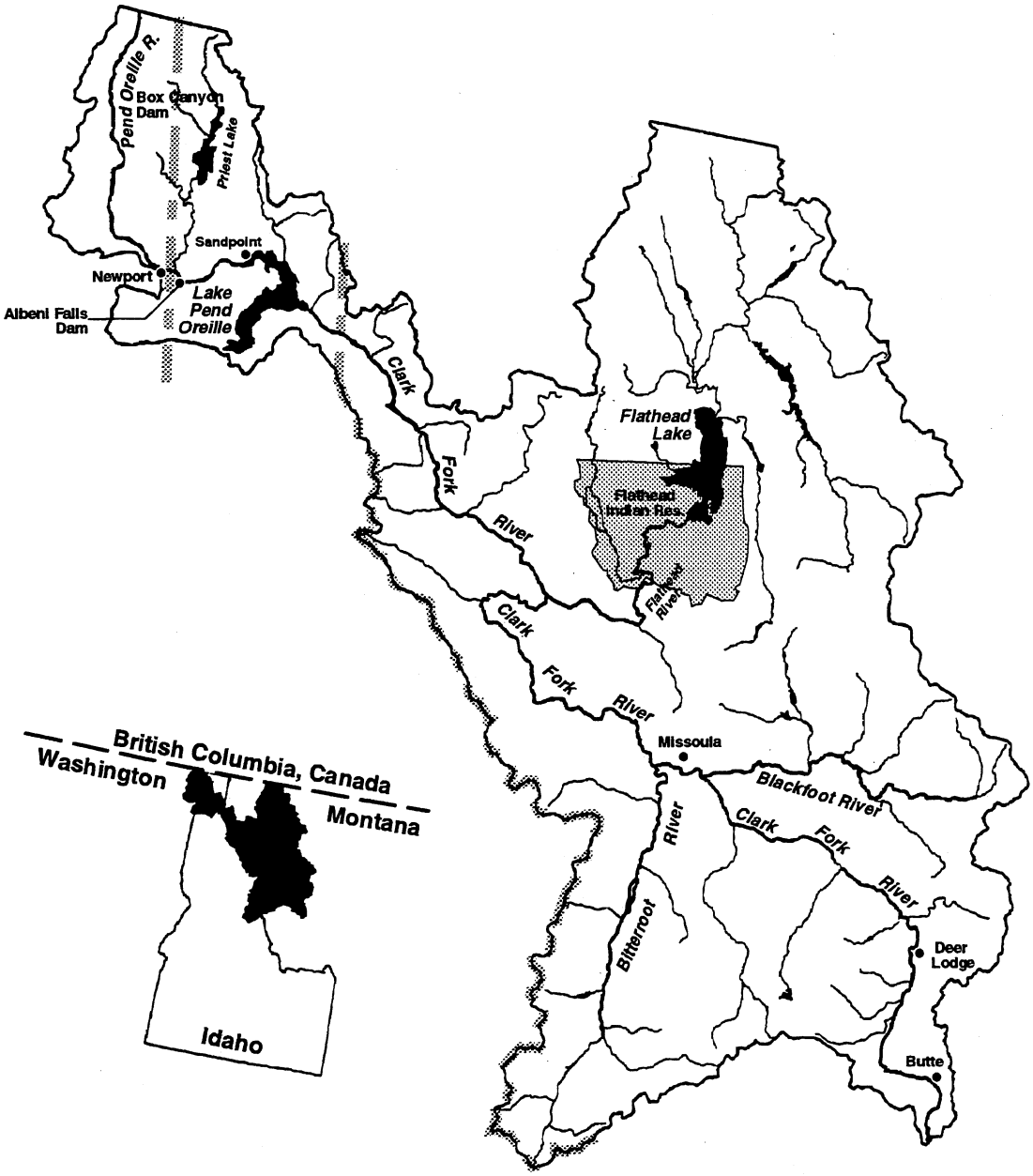
Clark Fork - Pend Oreille Basin Water Quality Study

A Summary of Findings and a Management Plan



Conducted Under Section 525 of The Clean Water Act of 1987

U.S. Environmental Protection Agency, Regions 8 and 10,
State of Montana, State of Idaho, and State of Washington

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CLARK FORK - PEND OREILLE BASIN

WATER QUALITY STUDY

A SUMMARY OF FINDINGS AND A MANAGEMENT PLAN

Conducted Under

SECTION 525 OF
THE CLEAN WATER ACT OF 1987

January 1993

U.S. Environmental Protection Agency, Regions 8 and 10
State of Montana
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Introduction and Acknowledgements

This document summarizes three years of water quality research in the Clark Fork-Pend Oreille Basin and provides a Management Plan for protection of the basin's water quality. All work was conducted pursuant to Section 525 of the 1987 amendments to the federal Clean Water Act as a cooperative effort among the states of Montana, Idaho, and Washington and with assistance from the U.S. Environmental Protection Agency. This report is a synthesis of the following three documents completed for the Clark Fork-Pend Oreille Basin Water Quality Study:

- A Rationale and Alternatives for Controlling Nutrients and Eutrophication Problems in the Clark Fork River Basin, by G. L. Ingman, Montana Department of Health and Environmental Sciences, Helena, 1992

- Phase I Diagnostic and Feasibility Analysis: A Strategy for Managing the Water Quality of Pend Oreille Lake, Bonner and Kootenai Counties, Idaho, 1988-1992, by B. Hoelscher, J. Skille, G. Rothrock, Idaho Department of Health and Welfare, Division of Environmental Quality, Boise, 1993.

- Pend Oreille River Management Plan, by R. Coots, Washington State Department of Ecology, Olympia, 1992.

State reports are available from each state's steering committee members.

This report is the fourth and final annual progress report for the Clark Fork-Pend Oreille Water Quality Study. The first, second, and third annual reports are available from any member of the Steering Committee.

Clark Fork-Pend Oreille Basin Water Quality Study Steering Committee

Gary Ingman Loren Bahls	Montana Department of Health and Environmental Sciences Water Quality Bureau Post Office Box 200901 Helena, MT 59620-0901	(406) 444-2406 FAX 444-1374
Brian Hoelscher Jack Skille	Idaho Department of Health and Welfare Idaho Division of Environmental Quality 2110 Ironwood Parkway Coeur d'Alene, ID 83814	(208) 667-3524 FAX 667-4869
Will Kendra Randy Coots	Washington Department of Ecology Watershed Assessments Section Post Office Box 47710 Olympia, WA 98504-7710	(206) 586-0803 FAX 586-5497
Judith Leckrone	U.S. EPA, Region 10 1200 Sixth Ave, WD-139 Seattle, WA 98101	(206) 553-6911 FAX 553-0165
William Roberts	U.S. EPA, Region 8 Montana Office 301 South Park Drawer 10096 Helena, MT 59626	(406) 449-5414 FAX 449-5434

The Steering Committee acknowledges the important contributions of previous Steering Committee members:

Mike Beckwith, U.S. Geological Survey, Idaho
Gwen Burr, Idaho Division of Environmental Quality
Mason Hewitt, EPA Environmental Monitoring Systems Laboratory, Las Vegas
Sally Marquis, EPA, Region 10, Seattle
Don Martin, EPA, Idaho Operations Office
Lee Shanklin, EPA, Region 8, Montana Office
Lynn Singleton, Washington Department of Ecology.

The Steering Committee thanks the following people for their assistance:

Diana Boquist, U.S. Environmental Protection Agency
Bronwyn Echols, Technical Writer
David Haire, Confederated Salish and Kootenai Tribes of the Flathead Reservation
Glen Rothrock, Idaho Division of Environmental Quality
Christopher Moffett, U.S. Environmental Protection Agency
Peter Nielsen, Clark Fork-Pend Oreille Coalition
Connie Robinson, U.S. Environmental Protection Agency
Ed Tulloch, Idaho Division of Environmental Quality
Ruth Watkins, Clark Fork-Pend Oreille Coalition

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Executive Summary

The Clark Fork-Pend Oreille Basin lies within western Montana, northern Idaho and northeastern Washington. The basin encompasses about 25,000 square miles and is the source of waters that enter and leave Pend Oreille Lake in Idaho. The Clark Fork River begins near Butte, Montana and drains an extensive area of western Montana before entering Pend Oreille Lake. The lake is the source of the Pend Oreille River in northeastern Washington which in turn drains into the Columbia River.

In response to concerns and complaints about the growing presence of algae and water weeds in the Clark Fork-Pend Oreille Basin, Congress mandated the United States Environmental Protection Agency (EPA) to conduct a comprehensive water quality study in the basin, and to report study findings and recommendations to Congress. This mandate appeared as Section 525 of the 1987 amendments to the federal Clean Water Act.[1] The main objectives of the study were to characterize water quality problems, identify sources and recommend actions for maintaining and enhancing water quality throughout the basin. This report and management plan are intended to meet the study and reporting requirements mandated in Section 525.

Regions 8 and 10 of the EPA had the primary federal responsibility for implementing the Clark Fork-Pend Oreille Basin Water Quality Study. The States of Montana, Idaho and Washington identified research objectives within their

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[1] Clean Water Act, 33 U.S.C. 1251, et seq., as amended by the Water Quality Act of 1987, P.L. 100-4, February 4, 1987.

boundaries, conducted the research, wrote reports and recommended state-specific management actions that would meet the basin-wide study objectives. The Clark Fork-Pend Oreille Basin Water Quality Study Steering Committee, consisting of representatives from EPA and the three states, oversaw the study and reviewed and summarized the three state plans into this document, the Clark Fork-Pend Oreille Basin Water Quality Study: A Summary of Findings and a Management Plan.

The Steering Committee invited all interested persons and agencies to comment on individual state management plans and the basin-wide management plan. The Committee sponsored four public workshops in Deer Lodge and Missoula, Montana, Sandpoint, Idaho and Newport, Washington. The Committee also requested comments by mail from over five hundred individuals, agencies and other groups on the mailing list. (Responses to these public comments are included as Appendix C.)

Research Findings and Conclusions

The three-year Clark Fork-Pend Oreille Water Quality Study yielded the following major research findings and conclusions:

Clark Fork River

- Excessive levels of algae caused water use impairment in up to 250 miles of the Clark Fork River.

- About half of the soluble phosphorus derives from wastewater discharges, with the other half contributed by nonpoint sources in tributary watersheds. Three-fourths of the soluble nitrogen comes from tributaries, with the remaining quarter from wastewater discharges.

- The most critical point sources are the municipal wastewater treatment plants, particularly at Butte, Deer Lodge and Missoula. The Stone Container Corporation's Missoula Mill is a major source of industrial wastewater nutrient loading to the river, although the levels of nutrients in its effluent over the past six years have been reduced several fold.

- Phosphate detergent bans in several communities along the river have decreased the phosphorus content of the effluent of the municipal wastewater treatment plants.

- The largest nonpoint sources of nutrient loading to the Clark Fork River are the Flathead, Bitterroot, and Blackfoot rivers.

- A nonpoint source stream reach assessment found that of 99 basin streams with suspected problems, 65 percent have an impaired ability to support designated beneficial water uses.

Pend Oreille Lake

- Open lake water quality has not changed statistically since the mid-1950s.

- There is a high correlation between total phosphorous loading from nearshore and local tributaries and the degree of urban development.

- The greatest share (more than 90 percent) of water entering the lake comes from the Clark Fork River inflow, as does about 85 percent of the total loading of phosphorus, the nutrient that limits algae growth in the lake.

- Maintenance of open lake water quality is largely dependent on maintaining nutrient loadings from the Clark Fork River at or below their present levels.

- Pack River, followed by Sand Creek, are the tributaries discharging the highest phosphorus loads per unit of land area to the lake. Lightning Creek, Pack River, and Sand Creek have the highest nitrogen levels.

Pend Oreille River

- The mainstem Pend Oreille River has water quality that is generally good and in the oligo-mesotrophic range.

- The primary water quality concern on the Pend Oreille River is the proliferation of Eurasian watermilfoil, an invasive and adaptable plant.

- Roughly 75 percent of the external nitrogen and phosphorus loading to this reach of the river comes from the Newport wastewater treatment plant, Calispell Creek, and Trimble Creek.

- Several tributaries exceed standards for fecal coliform bacteria content.

- Nonpoint sources of pollutants in the Pend Oreille River basin that potentially affect the river are animal keeping practices, agriculture, on-site sewage disposal, stormwater and highway runoff, forest practices, land development, landfills, and gravel extraction.

Recommended Management Objectives, Actions and Priorities

Based on the research findings and conclusions, the Steering Committee of the Clark Fork-Pend Oreille Basin Water Quality Study recommends the following water quality management goals and objectives for the basin.

Goal: Restore and Protect Designated Beneficial Water Uses Basin-Wide.

Objectives:

- Control nuisance algae in the Clark Fork River by reducing nutrient concentrations.

- Protect Pend Oreille Lake water quality by maintaining or reducing current rates of nutrient loading from the Clark Fork River.

- Reduce nearshore eutrophication in Pend Oreille Lake by reducing nutrient loading from local sources.

- Improve Pend Oreille River water quality through macrophyte management and tributary nonpoint source controls.

Actions

Each state outlined numerous specific management actions to meet these basin-wide objectives. These recommended management actions were summarized into a an overall management plan for the entire basin. The recommended management actions include a spectrum of activities that ranges from mechanical harvesting of aquatic weeds, comprehensive public education programs, control of agricultural and residential nonpoint sources, revised permit limits on point sources, and developing and enforcing local zoning and stormwater

ordinances. For each recommended action, the plan identifies possible lead agencies, assigns a priority, estimates costs whenever possible, and identifies possible funding sources.

Priorities

The Steering Committee identified over 70 specific management actions. From these, the Committee has identified several actions to be the highest priority.

- Convene a Tri-State Implementation Council to implement the Management Plan recommendations.
- Establish a basin-wide phosphate detergent ban.
- Establish numeric nutrient loading targets for the Clark Fork River and Pend Oreille Lake.
- Develop and maintain programs to educate the public on their role in protecting and maintaining water quality.
- Control Eurasian watermilfoil by education, rotovation, and research into alternative methods.
- Install centralized sewer systems for developed areas on Pend Oreille Lake.
- Institute seasonal land application and other improvements at the Missoula municipal wastewater treatment facility.
- Enforce existing regulations and laws consistently and aggressively, in particular state anti-degradation statutes.
- Establish and maintain a water quality monitoring network to monitor effectiveness and trends and to better identify sources of pollutants.
- Develop and enforce stormwater control and erosion control plans and county ordinances.

Response to Citizens' Concerns: The Purpose and Organization of the Study

Purpose

The Clark Fork-Pend Oreille basin encompasses about 25,000 square miles of the intermountain Northwest in the states of Montana, Idaho, and Washington (Figure 1). The Clark Fork River, Pend Oreille Lake, and the Pend Oreille River are among the main bodies of water in the basin. The Clark Fork River has its headwaters near Butte, Montana, is fed by the Flathead, Bitterroot, and Blackfoot rivers and then flows into Pend Oreille Lake, Idaho's largest lake. Pend Oreille Lake is the source of the Pend Oreille River in northeastern Washington.

The Clark Fork-Pend Oreille Basin is characterized by highly valued recreational and economic resources and is the central focus of nearly every major urban, industrial and agricultural activity in the region. Vast resources of minerals, timber, fish, wildlife, water, rangeland and croplands support a variety of human uses, ranging from mining and agriculture to recreational fishing and boating.

In response to citizens' concerns about water quality in the basin, members of the three states' Congressional delegations added Section 525 to the Clean Water Act of 1987 which directed the U.S. Environmental Protection Agency (EPA) to conduct a comprehensive water quality study in the Clark Fork-Pend Oreille Basin. Congress, however, did not immediately appropriate the necessary funds for the study. Section 525 of the 1987 amendments to the Clean Water Act states:

Clark Fork - Pend Oreille Basin

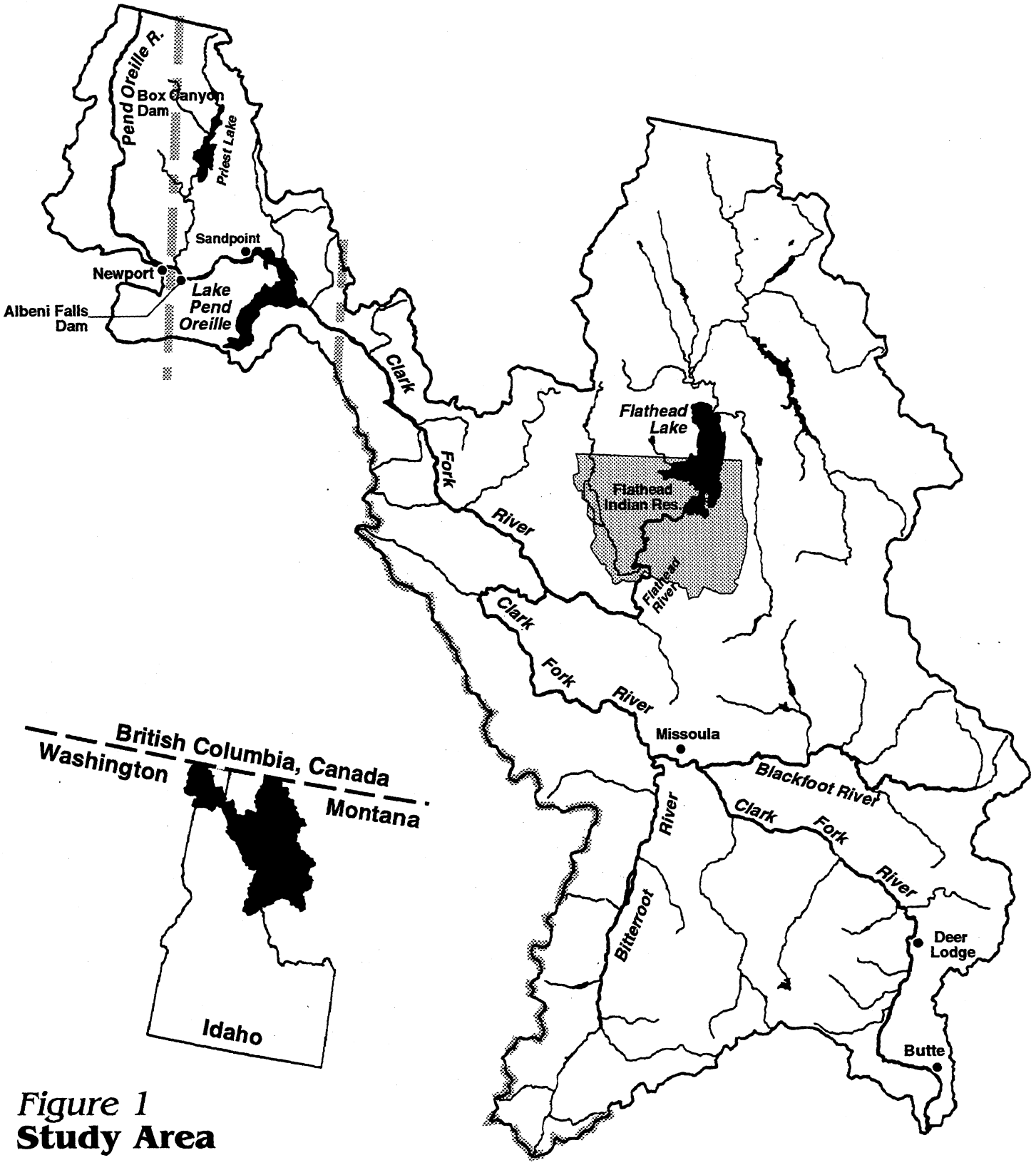

Figure 1
Study Area

STUDY OF POLLUTION IN LAKE PEND OREILLE, IDAHO.
The Administrator shall conduct a comprehensive study of the sources of pollution in Lake Pend Oreille, Idaho, and the Clark Fork River and its tributaries, Idaho, Montana, and Washington, for the purpose of identifying the sources of such pollution. In conducting such study, the Administrator shall consider existing studies, surveys, and test results concerning such pollution. The Administrator shall report to Congress the findings and recommendations concerning the study conducted under this section.

Concerns about environmental problems in the basin are longstanding. The two greatest concerns are pollution from heavy metals from past mining and smelting activities in the headwaters of the Clark Fork River and eutrophication problems caused by excessive nutrients. Eutrophication manifests itself in the Clark Fork River in Montana as abundant developments of nuisance attached algae that impair most designated uses of the river. In Pend Oreille Lake, increasing growths of algae and other water plants in nearshore areas and decreasing water clarity are the primary concerns. In Washington, the Pend Oreille River is choked with nearly continous growths of water plants that impede boat traffic and most other uses. Increasing population in the inland Northwest are likely to exacerbate these water quality problems in the near future.

In 1988, the Montana Governor's Office released the Clark Fork Basin Project Status Report and Action Plan. The Action Plan provided specific recommendations for addressing the nutrient problems in the basin and called for a coordinated program to investigate the sources and fate of nutrients in the Clark Fork-Pend Oreille Basin. Encouraged by Congress' action and prompted by the Governor's report, the citizen's group known as the Clark Fork-Pend Oreille Coalition (formerly the Clark Fork Coalition) successfully pushed for appropriation of funds to complete the comprehensive, basin-wide assessment authorized by Section 525.

Although the Montana Governor's Office report identified the mining-related heavy metals pollution in the headwaters area as the most acute problem in the

basin, the Steering Committee decided to restrict the water quality studies to nutrient and eutrophication problems because they are the primary interstate water quality issue and are affecting the largest portion of the basin. In addition, investigations and remedial activities on the metals contamination were already well underway through the federal Superfund Program.

This report, the Clark Fork-Pend Oreille Water Quality Study: A Summary of Findings and a Management Plan, summarizes the findings of three years of research conducted pusuant to Section 525. It also provides a management plan for the basin. This is the fourth and final report on the Clark Fork-Pend Oreille Water Quality Study.

Organization

Though Section 525 of the Clean Water Act directs EPA to conduct the study, the project was a joint effort of working teams from Montana, Idaho, Washington, Regions 8 and 10 of the EPA and from EPA's Environmental Monitoring Systems Laboratory at Las Vegas (EMSL-LV). EPA convened the Clark Fork-Pend Oreille Basin Water Quality Steering Committee to oversee the study. The Steering Committee comprises representatives from the two EPA regional offices and the agency from each state responsible for water quality management: the Water Quality Bureau of the Montana Department of Health and Environmental Sciences (MDHES), Idaho's Division of Environmental Quality (DEQ), and Washington's Department of Ecology (Ecology). The Steering Committee met regularly and communicated frequently to oversee progress and to coordinate the three states' research.

Each of the state agencies worked with other agencies and organizations within its state to carry out the research. In Montana, additional work was conducted by EMSL-LV, the Natural Resource Information System (NRIS) at the

Montana State Library, the University of Montana, the U.S. Geological Survey, and several independent contractors.

In Idaho, DEQ managed a Clean Lakes Phase I Project for Pend Oreille Lake which was funded through an EPA Clean Lakes Program grant as well as by Section 525. The U.S. Geological Survey, EMSL-LV, the University of Idaho, the Idaho Department of Fish and Game, Eastern Washington University, the Bonner County Planning and Development Department, and the Panhandle Health District also contributed research to the project. The DEQ project team also convened a Technical Advisory Committee to coordinate and integrate research elements and to review subcontractor results, and a Policy Advisory Committee representing agencies, industries, and interest groups with direct involvement in or concern for Pend Oreille Lake's water quality.

In Washington, the U.S. Army Corps of Engineers, the University of Idaho, and the Pend Oreille County Public Works Department contributed research.

To implement the Management Plan developed as a result of the Clark Fork-Pend Oreille Water Quality Study, EPA and the state agencies will have a guiding role in directing future research, coordinating management regulations, and continuing the interstate links forged through the project. Many other agencies and organizations will be active participants in the success of the management plans. Federal, tribal, state, and local units of government, each with oversight of part of the basin's water quality equation, will be working together for years to come to ensure clean water in the Clark Fork River, Pend Oreille Lake, and Pend Oreille River system. Citizens' groups have parts to play, also. The Clark Fork-Pend Oreille Coalition was instrumental in bringing about the Clark Fork-Pend Oreille Water Quality Study and will maintain active participation in basin water quality efforts. In Idaho, the Clean Lakes Coordinating Council will continue to work with the agencies responsible for the management of Pend Oreille Lake. The ultimate success of the Clark Fork-Pend Oreille Basin Management Plan will depend

upon how well all of these agencies and organizations can frame common goals for water quality, agree upon the methods to be used in meeting these goals, and work together to take necessary actions to protect basin waters.

The State of the Basin

Clark Fork River

The Clark Fork River watershed is the largest subunit of the Clark Fork-Pend Oreille research area, comprising some 22,000 square miles, or nearly 90 percent of the Clark Fork-Pend Oreille Basin. A wide range of human activity, from urban centers to farming hamlets, is found within this region. Butte, at the Clark Fork River's headwaters is a city of some 34,000. Copper mining has been the city's major industry for decades. Missoula lies along the middle reaches of the river. It is home to about 34,000 people and the University of Montana. Both these cities are service and retail hubs for their regions. Between the hills that surround Butte and the mountains that begin to rise near Missoula lies the Deer Lodge Valley, a broad and fertile swale with numerous farms and ranches. Further downstream, the mountainous terrain between Missoula and the Idaho border is sparsely settled. Much of the western portion of the watershed is forested mountains, predominantly national forest. Part is wilderness and the remainder is managed for multiple uses, including logging and mineral extraction.

The economy of the region is predominantly natural resource based, with forestry, mining, and agriculture the major industries. In recent years, recreation and tourism have played an increasing role in the region's economy. In the valleys, the largest farms and ranches grow various short season crops, such as hay and winter wheat, as well as raise livestock. Vacation home development is occurring as the region increases in popularity as a recreational destination for skiing, fishing, hiking, and hunting. The cities and towns are more densely settled, but

development and accompanying sprawl are progressing at a fairly restrained pace. The exception is the booming Flathead Valley which is attracting a large population from outside the state.

These diverse land uses and economic activities in the Clark Fork River drainage area have led to an associated range of water quality problems. Apart from the heavy metals residual from mining wastes in the river's headwaters, the most pressing of these are the excessive nutrients that promote the growth of nuisance algae in the Clark Fork River. High concentrations of phosphorus and nitrogen have led to blooms of filamentous algae in the Clark Fork River above Missoula and heavy growths of slime, or diatom, algae below the city. Beside being unattractive, algae impair beneficial uses of the river water, such as irrigation and recreation. Dead and decaying algae form sludge that clouds the water and produces nuisance river foam. Algal respiration also depletes dissolved oxygen required for healthy and balanced populations of fish and other aquatic life. On the lower river, the primary concern is the discharge of nutrients to Pend Oreille Lake.

Pend Oreille Lake

The Pend Oreille Lake watershed is sparsely settled. Bonner County, which almost entirely contains the lake, has a population of about 26,000. Sandpoint, the county's largest city with about 5,200 residents, and the surrounding cities and rural areas along the north shore of the lake hold about half the county's population. In summer, an additional 5,000 people call the north shore their home. Bonner County is predicted to have continuing strong growth as a nonmetropolitan area. By the year 2010, the population may reach 35,000 -- an increase of nearly one-third.

Like the rest of the Clark Fork-Pend Oreille Basin, an array of land uses characterize the Pend Oreille Lake watershed. Much of the northern and eastern parts of the watershed are public lands comprise mountainous or hilly terrain

deeply cut by streams and mostly forested. The broad, fertile valleys and river bottoms, predominately in the western part of the watershed, are mostly in private ownership. Near the lake and on its shore, private lands account for more than half of the ownership. Timber is the region's primary natural resource industry. Until very recently, this and other natural resource based industries dominated the region's economy. However, jobs in services and retail trade are increasing as the region becomes more popular for second home development, tourism, and recreation. It is estimated that recreation and tourism contribute about $20 million annually to the local economy. Livestock grazing and short season crops, such as hay, wheat, oats, and barley, are important land uses in the valleys and on the lower slopes. Rarely are these operations very large.

Developed lands, primarily residential, are concentrated in a broad valley stretching north of Sandpoint. In this area, semi-rural residential development is gradually replacing agriculture. Almost half of all developable land in the watershed is located within one mile of the lake shore, indicating that the development pressure predicted by population growth figures will be concentrated fairly close to the lake.

Pend Oreille Lake is designated a Special Resource Water under Idaho's Water Quality Standards and Wastewater Treatment Requirements. No new point source discharges are allowed, nor may existing sources increase discharges of pollutants to the lake, a tributary, or an upstream segment if these discharges would compromise water quality necessary to designated uses of the special resource water. Pend Oreille Lake's designated uses are water supply, recreation, salmonid spawning, cold-water biota, wildlife habitat, and aesthetics.

Human activities in the basin have led to water quality concerns about Pend Oreille Lake. Paramount among these are excessive nutrients that promote the growth of slime (attached benthic algae) on shoreline rocks, structures, and boats.

If left unmanaged, the algae eventually could impair of the lake's aesthetic qualities, recreational uses and domestic water supplies.

Pend Oreille River

The Pend Oreille River drains Pend Oreille Lake. Its basin lies mainly in Pend Oreille County, a sparsely settled rural region in northeast Washington. The largest city, Newport, has fewer than 1600 residents. The next largest town, Ione, has about 500 residents. Local, state, and federal government jobs account for 43 percent of employment, with the remaining 57 percent split between retail, manufacturing, and service jobs.

Much of the river basin's land falls within the boundaries of the Kaniksu or Colville national forests. Two-thirds of the northern and central parts of the county are government owned; the southern portion is mostly privately owned. The basin's topography consists of river-bottom flatlands in a long and narrow trough between the Selkirk Mountains and Okanagan Highlands. Agriculture on the lowland plains includes grain crops, hay, pasture, and livestock. The area is largely forested with rough mountainous terrain. Private land ownership is concentrated on river and lake shorelines as strip development.

Milfoil is the mainstem Pend Oreille River's most serious problem. If left unchecked, this tenacious water weed could choke life from the river. In addition to restricting human recreational access to the river, existing data suggest milfoil may also be limiting to the fishery.

Previous Studies and Current Management Programs

The language of Section 525 of the Clean Water Act specifically directs the EPA to "... consider existing studies, surveys, and test results concerning such pollution" in the course of the study. Therefore, before discussing the Section 525 research, findings, and management recommendations, it is important to briefly describe previously conducted studies and current water quality management activities in the Clark Fork-Pend Oreille Basin. The management plan developed for the watershed under Section 525 takes into account and builds upon these efforts.

Clark Fork River

Other Studies

The Clark Fork River has been the subject of water quality concern for many years, primarily because of the residues of heavy metals left behind by the intensive mining around its headwaters. The Clark Fork River is probably the most thoroughly studied stream in the state. Research has ranged from examinations of water chemistry, hydrology, and contaminants to characterizations of the flora and fauna of the river and its tributaries. The effects of mining, logging, agriculture, sewage treatment plants and industrial discharges have also been explored. More recently, attention has turned to the high concentrations of nutrients in the upper and middle Clark Fork River.

A long-range comprehensive study of the Clark Fork Basin was inaugurated in 1984. Its final report, the Clark Fork Basin Project Status Report and Action Plan gathered fragmented information from the numerous studies of the Clark Fork

River. It reviewed the history of water and land uses in the basin, surveyed previous and current research directed at solving water quality problems, and made recommendations for future study and action. This report provided the framework for the Section 525 Clark Fork-Pend Oreille Water Quality Study.

Current Management Activities

A number of water management activities are already in place in the Clark Fork Basin. Management activities that include nutrient control measures include the Montana Pollutant Discharge Elimination System to control point source discharges of wastewater to protect stream quality; the state's Nondegradation Rules applying to new or increased sources of pollution; Montana's Nonpoint Source Pollution Control Program and the Flathead Basin Phosphorus Control Strategy. The communities of Missoula, Superior, and Alberton have adopted bans on phosphate-containing detergents, and the Stone Container Corporation kraft mill has steadily reduced the nutrient content of its wastewater discharge over the past six years.

In addition, the Salish and Kootenai Tribes have begun an aggressive water quality monitoring program on the Flathead Indian Reservation. The tribes have enacted a water quality ordinance for controlling point and nonpoint sources of pollution and are currently implementing the ordinance. The tribes also cooperated with the State of Montana on Flathead River Basin data collection and monitoring activities to determine nutrient sources in the Flathead Basin.

The upper Clark Fork River Basin has long suffered from the over-appropriation of water. The result has been serious stream dewatering problems during summer months which compromise all water uses. Low stream flows also aggravate the nutrient problem, especially in reaches below wastewater discharges, and promote the development of nuisance levels of algae. In 1991, the Montana Legislature passed legislation which placed a moratorium on most

new surface water rights in the upper basin. It also created the Upper Clark Fork River Basin Steering Committee and charged it with writing a management plan for waters of the upper basin. This plan must consider and balance all beneficial uses of water and develop recommendations to alleviate water shortages. The plan is scheduled for completion in December 1994.

A century of mining and smelting has left the Upper Clark Fork River and its tributaries severely polluted by toxic metals and other chemicals. EPA has listed four Superfund sites in the upper Clark Fork River basin on the National Priority List. Since 1982, EPA, MDHES, industries, and other agencies have worked together to investigate and prescribe clean-up procedures. Efforts conducted under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund) are being organized through the Clark Fork Superfund Master Plan.

Pend Oreille Lake

Other Studies

Pend Oreille Lake has also been the subject of considerable research since the mid-1980s. In 1984, researchers began monitoring the lake and the Clark Fork River to measure nutrients, sediments, and heavy metals. This was in response to the temporary discharge permit that allowed the Stone Container Corporation plant at Missoula to increase industrial wastewater outflows into the Clark Fork River. As a result of the sampling, researchers classified the lake as on the border between nutrient poor (oligotrophic) and moderately fertile (mesotrophic). Phosphorus was found to be the nutrient most often limiting to aquatic plants and algae, and some evidence indicated that heavy metals inhibited algal growth. In 1986, researchers first reported increased attached algae levels in shallow bays and nearshore waters.

Current Management Activities

The Idaho Division of Environmental Quality has provided technical and financial assistance for management of the lake's watershed. Particularly, the creation of several sewer districts around the lake has resulted in the planning and upgrading of wastewater treatment systems. Bonner County's ban on phosphate detergents, the National Pollutant Discharge Elimination System which controls point source discharges of wastewater, the state's Antidegradation Policy applying to new or increased sources of point sources of pollution to Special Resource Waters, and nonpoint source programs designed to reduce pollution from forest practices and state road construction and maintenance are nutrient control measures that are already in place.

Pend Oreille River

Other Studies

Besides the Section 525 research, other Pend Oreille River projects include: 1) yearly studies of fisheries improvement opportunities conducted by the Upper Columbia United Tribes Fisheries Center at Eastern Washington University and funded by the Bonneville Power Administration; and 2) a two-year study by University of Idaho researchers of Box Canyon Reservoir's water quality, fish, wildlife and shoreline characteristics, and recreation and tourism opportunities. That study was completed with funding from the Pend Oreille County Public Utility District. The U.S. Army Corps of Engineers investigated water flow through river weed beds in an 1988 study, and is currently experimenting with the use of the aquatic herbicide trichlopyr for milfoil control. Additional water quality work on the river has focused on weed beds and rotovation in yearly evaluations of the Pend Oreille River Eurasian watermilfoil control program by consultants for the Pend Oreille County Public Works Department.

Current Management Activities

Since 1984, Pend Oreille County has tried several methods to control the spread of Eurasian watermilfoil, first through the application of the herbicide 2,4-D (the use of which is no longer allowed by EPA) and subsequently via the mechanical bottom tillage method known as rotovation, originally pioneered by the British Columbia Ministry of Environment for the Okanagan lakes. (Rotovation is the mechanical harvesting of aquatic weeds.) The rotovator in use since 1988 was purchased by the county's Public Works Department under a joint funding arrangement with Ecology and the U.S. Army Corps of Engineers.

Scoping the Sources: Research Objectives

The primary research objective for the Clark Fork-Pend Oreille Water Quality Study was to evaluate the major interstate water quality issue: eutrophication problems caused by excessive quantities of nitrogen and phosphorus.

Two broad challenges were tackled by researchers during the three year study:

- Document water quality problems caused by pollution sources in the watershed; and
- Recommend actions for protecting and restoring water resources throughout the basin.

Each state team outlined research objectives specific to the water quality problems of its part of the basin while keeping in mind the basin-wide nature of the project. Each state then conducted studies to meet those objectives. Montana studied the Clark Fork River. Idaho completed a federal Clean Lakes Phase I study on Pend Oreille Lake in order to meet its commitment, and Washington focused its research on the Pend Oreille River. Following completion of the third year of research, each group wrote a management plan. The individual state plans were then forged into the Management Plan that is included in this document.

Clark Fork River

Research Objectives

The concerns of Montana researchers were two-fold: 1) abundant growths of attached algae in the Clark Fork River and their effects on beneficial water uses,

and 2) nutrient loading to Pend Oreille Lake from the river. Specific research tasks were:

- Identify the sources of nutrients in Montana's portion of the watershed, develop a nutrient budget, and formulate a nutrient control strategy;
- Document the extent and severity of nuisance algae in the Clark Fork River, evaluate the role of instream nutrients in promoting algae growth, and determine what effect nutrient controls would have on the algae, fisheries, and riverine ecosystem; and
- Assimilate study results through use of a computerized Geographic Information System (GIS).

Research Conducted

Montana researchers intensively monitored the 350 miles of the Clark Fork River from its headwaters to the Idaho border, many of its tributaries, and most of the point source discharges of wastewater. This work provided data and information on the major sources of nutrients to the river. Section 525 research in Montana:

- Assessed the extent and severity of nuisance algae in the river and developed nutrient criteria for the control of algae growth;
- Determined instream nutrient concentrations from headwaters to Pend Oreille Lake, documented and ranked nutrient contributions from tributaries and wastewater discharges, and identified the sources that can be most readily controlled;
- Compiled data on the nonpoint sources and causes of water quality impairment within the tributary basins, along with information on the geographical distribution of problem streams; and

- Evaluated the potential negative effects of nutrient controls on fish production.

In addition to this research, EMSL-LV developed a GIS for the Blackfoot River watershed. (A GIS integrates data from many sources and may be used to analyze how various topographic, climatic, geologic, biotic, and land use factors affect water quality.) The focus of the GIS work was nonpoint source pollution, particularly from silvicultural practices and livestock production. The Blackfoot River was selected as a demonstration project since it is a subbasin of the Clark Fork River, and had all nonpoint source modeling requirements. EMSL-LV worked directly with the Montana State Library and the Water Quality Bureau on remotely-sensed data acquisition, GIS database layering, and development of a user interface.

Concurrent with the Blackfoot River GIS project, the Natural Resource Information System at the Montana State Library developed a GIS system for the entire Clark Fork River watershed. The latter system was used extensively to help evaluate the Clark Fork-Pend Oreille Water Quality Study data and to display results. Both the Clark Fork River and the Blackfoot River GIS systems are housed at the Montana State Library where they will continue to be available for basin-wide water quality management and planning purposes. Plans are underway to increase the accessibility of the GIS systems to government and private institutions.

Pend Oreille Lake

Research Objectives

For Pend Oreille Lake, the major charges were to investigate citizens' concerns about increased growths of algae and the potential for lake eutrophication

caused by nutrients from the Clark Fork River and rapid population growth and development in the immediate lake basin. Specific research objectives included:

- Assess current water quality and characterize the trophic status of the littoral, pelagic, and riverine zones of the lake;
- Identify and quantify nutrient inputs from natural, point, and nonpoint sources and prepare a mass balance nutrient budget for the lake;
- Conduct a land use inventory of the Idaho portion of the watershed;
- Develop a predictive computer model of the lake's response to nutrient loads; and
- Formulate alternative water quality management strategies and select and initiate a comprehensive, long-term water quality management plan.

Research Conducted

The Idaho project team used several methods, including water quality monitoring in the lake and its tributaries and outflow, creating computer models, measuring organic productivity, and listing and mapping various land uses. Specific research accomplishments were:

- The U.S. Geological Survey (USGS) collected limnological and hydrological data from the lake and its tributaries and outflow to describe the lake's trophic status and develop nutrient and hydrological budgets for the lake.
- The USGS used an empirical nutrient load-lake response computer model to simulate how the open, deep area of the lake would respond to different rates of nutrient loading.
- University of Idaho researchers assessed nearshore water quality and algae production, and identified the types of phytoplankton found in the deeper waters of the lake.

- The Panhandle Health District inventoried all septic tanks close to the lake for use in the nutrient load-lake response computer model.
- The Bonner County Planning and Development Department and Eastern Washington University listed all current and anticipated land use practices in the Idaho portion of the watershed.
- The DEQ and Idaho Department of Fish and Game compiled all available knowledge on the lake's fishery, described its economic value, provided general information on heavy metal accumulation in fish tissue, and discussed the effects on fish populations of the proposed water quality goals.
- EMSL-LV used satellite imagery to identify vegetative cover in the Idaho watershed and aerial photographs to map aquatic macrophytes and potential nonpoint nutrient sources.

Pend Oreille River

Research Objectives

The Pend Oreille River research centered around overall water quality and point and nonpoint pollution sources on the mainstem river and selected tributaries, in order to determine how to maintain the river's generally good water quality and to manage the worsening Eurasian watermilfoil (*Myriophyllum spicatum*) invasion.

Research Conducted

Sampling of water, aquatic plants, and fish as chemical and biological indicators was the primary research method in Washington during all three years of the project. Washington scientists addressed the question of the river's trophic status and its effect on aquatic plant and fish life. The researchers:

- Evaluated the general water quality of the mainstem river and determined pollutant loading from tributaries to Box Canyon Reservoir;

- Assessed fish communities and water quality within and outside weed beds; and
- Estimated primary productivity in the river mainstem and conducted further studies on the water quality and pollution sources of selected problem tributaries.

Researchers also conducted experiments with a variety of rotovation techniques and looked at several patterns of rotovation as methods for management and control of Eurasian watermilfoil.

Research Findings

Clark Fork River

The highest densities of attached algae in the upper Clark Fork River occur between Drummond and the Blackfoot River inflow, and in the middle river between Missoula and Harper Bridge. British Columbia, Canada, has proposed that undesirable changes occur in river communities when algal densities go above 100 milligrams of chlorophyll *a* per square meter, and that aesthetics and recreational uses are impaired at half this level. Upper river algal densities are four and eight times these criteria, respectively, while middle river algal densities are three and six times these criteria. Algal respiration causes dissolved oxygen levels in the river to fall below applicable state water quality standards in a number of reaches between the headwaters and the Flathead River confluence.

The nutrient source inventory project shows that about half of the soluble phosphorus (the form of the nutrient most readily available for use by plants and algae) derives from wastewater discharges, with the other half contributed by nonpoint sources in tributary watersheds. Three-fourths of the soluble nitrogen came from tributaries, with the remaining quarter from wastewater discharges.

A number of wastewater discharges, or point sources of potential pollutants, occur along the Clark Fork River. For the purposes of this study, with its focus on excessive nutrients, the most critical point sources are the municipal wastewater treatment plants, particularly at Butte, Deer Lodge, and Missoula. Nutrient loading from these plants correlates directly with reaches in the river at which nuisance algae problems are most prevalent. The Stone Container

Corporation's Missoula Mill is a major source of industrial wastewater nutrient loading to the river, although the levels of nutrients in its effluent over the past six years have been reduced several fold. Phosphate detergent bans in several communities along the river have decreased the phosphorus content of these cities' municipal wastewater treatment plant effluent.

Nonpoint sources of soluble nutrients were identified in a number of the tributary watersheds in the Clark Fork Basin. The largest nonpoint sources of nutrient loading to the Clark Fork River are the Flathead, Bitterroot, and Blackfoot rivers. Groundwater seepage from the Missoula area contributes up to half of the nitrogen in the lower Bitterroot River during summer. Three small tributaries to the lower Flathead River that flow through the Flathead Reservation provide a large share of the nutrients that river contributed to the Clark Fork River. Many other creeks have high nutrient concentrations in their waters but smaller nutrient discharges overall. Several tributaries whose waters are cleaner, as well as the major rivers with considerable water volume, have a diluting effect on the Clark Fork River's nutrient concentrations. During several years of drought in the late 1980s, smaller volumes of spring runoff and summer rains meant higher amounts of nutrients per unit of water, especially in reaches of the river below wastewater discharges. However, the early 1990s have seen lower overall nutrient concentrations as a result of more normal precipitation and the improved quality of municipal and industrial discharges. The nonpoint source stream reach assessment found that of 99 basin streams with suspected problems, 65 percent have an impaired ability to support designated beneficial water uses. The largest number of impaired streams are located in the upper Clark Fork River and Blackfoot River basins.

Pend Oreille Lake

Pend Oreille Lake comprises two different aquatic regimes in one water body. The pelagic region, generally in the central and southern portions of the lake, is deep, clear, and cold, and is classified as oligotrophic. Researchers have found that water quality in this region of the lake has not changed since the mid-1950s. The nearshore littoral zone, which accounts for about 11 percent of lake volume, is classified as meso-oligotrophic and is the primary location for water quality problems. University researchers consistently found the highest nearshore algae growth in areas adjacent to shorelines with significant residential development. Attached algae levels at the most productive site are one-third to one-half those that other Northwest researchers have reported as constituting nuisance conditions.

The greatest share (more than 90 percent) of water entering the lake comes from the Clark Fork River inflow, as does about 85 percent of the total loading of phosphorus, the nutrient that limits algae growth in the lake. Measurements of nutrient loads entering the lake and exiting via the Pend Oreille River show that, year to year, 55,000 kilograms of total phosphorus and about 750,000 kilograms of total nitrogen remain in the lake.

A nutrient load-lake response model has been used to aid in predicting the effect these and other nutrient levels could have on the lake. Computer simulations indicate that the trophic state of the lake's pelagic waters would be little changed by small to moderate alterations in how much nitrogen and phosphorus entered the lake. The smallest responses come from complete removal of phosphorus and nitrogen inputs from nearshore septic tanks and discharges from the Sandpoint and Priest River wastewater treatment plants. This is not surprising, since wastewater contributes only about 3 percent of the lake's nutrient budget, and since the treatment plants discharge into the Pend Oreille River downstream from Sandpoint and do not enter the lake. Although the research did

not quantify the effect, removal of septic tank nutrient sources would probably improve nearshore water quality. Scientists found a correlation between higher nearshore algae growth and areas with higher phosphorus loadings. The largest responses were produced by alterations in nutrients contributed by the Clark Fork River. Therefore, maintenance of open lake water quality is largely dependent upon maintaining nutrient discharges from the Clark Fork River at or below their present levels. Reductions in nutrient contributions from the river would probably result in corresponding reductions in nearshore nutrient concentrations. The exact correlation is unknown as the rate of water exchange between the open lake and nearshore waters was not quantified.

The lake's flora and biota are consistent with the trophic classification. Phytoplankton species in Pend Oreille Lake indicate conditions to be oligotrophic but tending toward mesotrophy. The ascendancy of green and blue-green algae blooms in recent years may be an early indicator of eutrophication. Eurasian watermilfoil is not currently present in Pend Oreille Lake, though it is abundant immediately downstream of Albeni Falls Dam in the Pend Oreille River. Winter drawdown may prevent its gaining a foothold in the lake.

The sport fishery, a valuable resource to the state and local economy, is characterized by the native fishes westslope cutthroat trout, bull trout and mountain whitefish, and by kokanee salmon and rainbow trout which have been introduced into the system. Due to reduced numbers, westslope cutthroat trout and bull trout are listed as state species of special concern and federal sensitive species. Generally, the lake's fish catch in recent years has been one-fifth to one-third of past levels of production, probably due to hydropower development on the rivers flowing into and out of the lake and to land use practices that have damaged tributaries. Restoration to past levels of production is compatible with the water quality goals set for the lake.

Six point sources discharge treated wastewater into Pend Oreille Lake. Five have National Pollutant Discharge Elimination System (NPDES) permits. Nutrient loadings from these sources represent less than three percent of the total load to the lake. Bonner County's recent ban on phosphate detergents may contribute to an observed decline in phosphorus loads from the Sandpoint wastewater treatment facility. Scientists concluded that these discharges likely have minimal impact on the lake's pelagic water quality, and are more likely to affect nearshore areas and the Pend Oreille River.

Nonpoint sources in the Pend Oreille Lake watershed are the result of land uses activities that disturb or compact land, such as silviculture, agriculture, grazing, septic tanks, and urban runoff. Scientists estimating total phosphorus loading from nearshore and local tributaries found a high correlation between phosphorus loadings and the degree of urban development. Monitoring of tributaries flowing into and out of the lake allowed managers to estimate the amount of pollutants per unit of land area transported to the lake. Pack River, followed by Sand Creek, are the tributaries discharging the highest phosphorus loads per unit of land area to the lake. Lightning Creek, Pack River, and Sand Creek contribute the largest nitrogen loads. The Clark Fork River contributes the least amount of nutrients per unit of land area drained. However, since it provides most of the lake's water, the Clark Fork River contributes the lion's share of the nutrient load.

Pend Oreille River

The mainstem Pend Oreille River has water quality that is generally good and in the oligo-mesotrophic range, based on nitrogen and phosphorus concentrations, chlorophyll *a*, and Secchi disk transparency. Water and nutrient inputs from Washington tributaries account for less than 4 percent of the Pend Oreille River flow and nutrient load. Roughly 75 percent of the additional external nitrogen and

phosphorus loading to this reach of the river comes from the Newport wastewater treatment plant, Calispell Creek, and Trimble Creek. Nitrogen appears to be the limiting nutrient to plant growth during the late winter, while phosphorus may be limiting during the rest of the year.

Department of Ecology surveys show no violations of state water quality standards on the river, though several tributaries exceed standards for fecal coliform bacteria content. These tributaries are small enough that their effect on the main river's water quality is minimal at present because of high dilution ratios.

The primary water quality concern on the Pend Oreille River is the proliferation of Eurasian watermilfoil, an invasive and adaptable plant. Although the river appears to be dominated by milfoil, limited data suggest that other plants in the community, like pondweed, may be co-dominant. Milfoil's dense growth slows water velocities, so that nutrients and sediment precipitate out of the water column, thus promoting further macrophyte growth. Water column nutrients do not appear to be a factor in milfoil proliferation; phosphorus concentrations in the Pend Oreille River are well below the eutrophication threshold guideline of 25 micrograms per liter. However, water quality within the weed beds was found to be different from that of open water on the Pend Oreille River. Primary productivity in the river is fairly high, though fish numbers were quite low in the weed beds where sampling was done during the second year of the Clark Fork-Pend Oreille Water Quality Study. A GIS is assisting resource managers in tracking the expansion or upstream migration of macrophyte beds.

Nonpoint sources of pollutants in the Pend Oreille River basin that potentially affect the river are: animal keeping practices, agriculture, on-site sewage disposal, stormwater and highway runoff, forest practices, land development, landfills, and gravel extraction. The two permitted point sources, both within the Box Canyon Reservoir, are the Ponderay Newsprint Company plant at Usk (about 4.0 million

gallons per day permitted) and the Newport wastewater treatment plant (permitted monthly average discharge limit of 0.5 million gallons per day).

Managing the Watershed: The Management Plan

Though the Clark Fork-Pend Oreille Basin Water Quality Study Steering Committee completes its assigned mission with the release and distribution of this document, all agencies represented on the Steering Committee are committed to working with other agencies, tribes, and interested groups to convene a Tri-State Implementation Council to implement the management actions outlined in the plan. Ideally, the Council would include representatives from federal, tribal, state and county agencies, along with citizens and special interest groups. Since most of the recommended actions must be implemented at the local level, the Steering Committee recommends that the local agencies, tribes and other locally-based interest groups and citizens have a large role in the Council. The Tri-State Implementation Council is discussed in more detail in the next chapter. The Steering Committee envisions that this Management Plan will serve as a guide to the Council.

Management Goals and Objectives

All management plans must begin with a stated goal. Therefore, the Committee recommends the following:

Restore and Protect Designated Beneficial Water Uses Basin-Wide.

Often, a management plan involves selection of a single preferred management alternative to achieve the desired water quality goals. The Clark

Fork-Pend Oreille Basin Water Quality Steering Committee decided that this approach would be inappropriate, since the research and input from experts and citizens established that numerous actions would need to be taken in order to reach the water quality goals. In particular, the Policy Advisory Committee for the Pend Oreille Lake Clean Lakes Project believes that any large, expensive project or use of expensive in-lake restoration techniques are inappropriate at this time. Thus the Management Plan for responsible management of the water quality of the Clark Fork-Pend Oreille Basin is cumulative.

Over 70 specific management actions are outlined in the management matrixes that follow. Many are relatively inexpensive and fairly easy to implement. Some rely on existing programs and authorities. For the most part, the Clark Fork-Pend Oreille Basin Water Quality Steering Committee recommendations rely on voluntary approaches to nutrient controls and pollution reduction in the Clark Fork-Pend Oreille Basin. However, the states would pursue the development of optional nutrient wasteload allocations so that mandatory controls could be implemented if voluntary measures fail to achieve the desired results.

The Steering Committee sees education as one of the most effective methods of reducing the amount of nutrients that enter the Clark Fork-Pend Oreille Basin. Informed watershed and lake users will be more conscious of how their activities affect the body of water they depend on and value, and will be more willing to modify these activities to meet water quality goals they understand. Enforceable regulations such as local zoning and planning ordinances, and rules governing sale and use of detergents and fertilizers, are other recommended tools for controlling watershed activities that generate pollutants.

It should be noted that there are also other existing authorities on which to rely to manage the water quality of the basin. The Clean Water Act provides states with the broad authority to survey, report on, and to correct water quality problems. In addition, individual state water quality statutes stipulate that their

respective water quality agencies provide a comprehensive program for the prevention, abatement, and control of water pollution. Furthermore, each state's surface water quality standards designate water use classifications for all surface waters in the state and establish standards for protecting, maintaining, and improving their quality and potability.

Clark Fork River: Management Objective

- ***Control nuisance algae in the Clark Fork River by reducing nutrient concentrations.***

The Steering Committee recommends that instream ambient nutrient concentrations be reduced in the Clark Fork River from its headwaters to the Flathead River confluence to achieve decreases in attached algae levels sufficient to eliminate associated water quality standards violations, and to restore all designated beneficial water uses. Furthermore, maintenance or reduction of current rates of nutrient discharge in the Clark Fork River at the Montana-Idaho border would provide reasonable protection against accelerated cultural eutrophication in Pend Oreille Lake.

Benefits that would derive from this management objective include: reductions in algae growth and lessening of algal impacts on cold-water biota, recreation, and irrigation; improved water clarity and aesthetics; lessened surface foam; increases in dissolved oxygen levels; and a reduced threat of eutrophication in Pend Oreille Lake.

Recommended Instream Conditions for the Clark Fork River

Many factors may promote or inhibit algae growth, however those other than nutrient levels may be very difficult to control. Hence, criteria for water quality focus on the nutrients that will achieve the desired improvements in Clark Fork River waters. Experiments showed that the levels of attached diatom algae in

the middle Clark Fork River would be reduced with concentrations below 30 micrograms per liter for soluble phosphorus and 250 micrograms per liter for soluble nitrogen. The filamentous alga *Cladophora* dominating the upper Clark Fork River seemed able to thrive even when phosphorus was well below 30 micrograms per liter and nitrogen below 20 micrograms per liter. Its ability to persist in low nutrient environments may mean that its abundance can only be controlled, but not eliminated.

While algal level decreases can be expected with nutrient concentrations below the figures given, target concentrations at which all beneficial uses would be protected throughout the river are not available. Regardless, it would be appropriate to set summer nutrient target levels at concentrations found in river reaches where algae are not a problem. These goals are 6 micrograms per liter or less for phosphorus and 30 micrograms per liter or less for nitrogen. While controls necessary to meet these restrictive levels may not be feasible everywhere on the river, even lesser reductions, or restoration of beneficial uses in fewer river miles, would constitute a worthy goal.

Nutrient reductions may affect other flora and biota as well as nuisance algae. However, a study designed to address this question concluded that proposed target nutrient levels would have a small impact on the Clark Fork River's trout fishery, a beneficial use and economic resource currently restricted by a number of other problems.

Pend Oreille Lake: Management Objectives

- ***Protect Pend Oreille Lake Water Quality by Maintaining or Reducing Current Rates of Nutrient Loading from the Clark Fork River.***
- ***Reduce nearshore eutrophication in Pend Oreille Lake by reducing nutrient loading from local sources.***

Desired water quality goals for Pend Oreille Lake are maintenance of lake water quality and reduction of the rate of nearshore eutrophication. These two management recommendations seek to protect and preserve the beneficial water uses of Pend Oreille Lake by controlling pollutants, particularly phosphorus, that enter the lake from natural, point, and nonpoint sources. Controlling nutrient pollution from local nutrient sources, as well as from the Clark Fork River, is expected to reduce the level of attached algae and prevent lake-wide eutrophication. If nutrients are not controlled, algal growth can be expected to increase. Eventually increased levels of algae would impair the beneficial water uses of aesthetics, recreation, and domestic water supply.

Recommended Instream Conditions for Pend Oreille Lake

It was not possible to reach consensus on publicly acceptable levels of attached algae and therefore determine target nutrient concentrations for phosphorus in the lake. To resolve the issue, it was decided to set target nutrient levels at concentrations found at "undeveloped" sites. These target levels are two micrograms per liter for soluble phosphorus and five micrograms per liter for total phosphorus. Proposed target nutrient levels were determined to have a potentially small effect on the lake's fishery.

Pend Oreille River: Management Objective

- ***Improve Pend Oreille River water quality through macrophyte management and tributary nonpoint source controls.***

The primary problem afflicting the Pend Oreille River water quality is pervasive milfoil. Rotovation, as the most effective management tool, should continue in high use areas of the river. One rotovator is able to maintain about 200 acres of macrophyte beds. An additional rotovator should be purchased to double the amount of weed bed cleared. This additional machine could also be

used to strip-rotovate milfoil beds in less used parts of the river to improve fish habitat, since strip rotovation provides a more diverse fishery habitat in weed beds. Since harvested aquatic plants could have beneficial uses, resource managers should investigate alternatives to disposing of the harvested weeds on the banks of the river (e.g. using harvested materials as fertilizer). Educating boat owners on how they can prevent the spread of milfoil is also crucial. Pend Oreille County could be the lead agency, with assistance from the county's Public Utility District, Ecology, and the U.S. Army Corps of Engineers.

Herbicide applications in high use areas may be feasible, though more research is needed on application rates in flowing waters. With possible approval of trichlopyr by the EPA, local water quality managers may be able to experiment with herbicide control of milfoil, with projected state and federal technical and financial assistance. Biological agents, particularly aquatic insects and fungi, the subject of ongoing research, may also be an additional management method for the future.

The two major wastewater discharge sources, the Ponderay Newsprint Plant and the Newport sewage treatment plant, are adequately limited by NPDES permits. No additional conventional pollutant controls are recommended at present.

Since agricultural practices are likely a significant contributor of fecal coliform bacteria and nutrients levels in Pend Oreille River tributaries, implementation of best management practices (BMPs) would be the best way of improving water quality in these streams. Additional sampling, however, would be needed to better identify and prioritize problem areas and sources. The Pend Oreille Conservation District, as the responsible agency for BMP development and implementation related to agricultural water quality protection and management, could be the lead agency in conducting additional monitoring and follow-up on these nonpoint source problems. Education is crucial in this arena, since

landowners who understand the deleterious effect of poor agricultural management practices on the common water resource are more likely to accept and implement BMPs.

Recommended Instream Conditions for Pend Oreille River

No special instream conditions are warranted for the mainstem Pend Oreille River since no obvious problems related to excessive nutrients occur. Attached algae communities do not approach nuisance levels, and free-floating algae indicates unpolluted waters in the main stem of the Pend Oreille River. Primary productivity of the main river was in the middle to upper range of the values reported in the scientific literature for larger rivers. In order to protect Box Canyon Reservoir from accelerated eutrophication, however, several tributaries that have elevated nutrient levels should meet a general guideline of less than 50 micrograms of phosphorus per liter.

Management Matrixes

The following matrixes outline the Steering Committee's recommended actions for protection and restoration of Clark Fork-Pend Oreille Basin water quality. The actions are organized according to the four management objectives for the basin.

- ***Control nuisance algae in the Clark Fork River by reducing nutrient concentrations.***

- ***Protect Pend Oreille Lake water quality by maintaining or reducing current rates of nutrient loading from the Clark Fork River.***

- ***Reduce nearshore eutrophication in Pend Oreille Lake by reducing nutrient loading from local sources.***

- ***Improve Pend Oreille River water quality through macrophyte management and tributary nonpoint source controls.***

A key to the abbreviations and the recommended funding sources in the matrixes can be found on page 52.

MANAGEMENT OBJECTIVE: Control Nuisance Algae in the Clark Fork River by Reducing Nutrient Concentrations.

POINT SOURCE CONTROLS

Management Action	Lead Agency	Priority	Cost (thousands)	Funding Source(s)
Implement seasonal land application and/or other improvements at the Missoula wastewater facility.	City of Missoula	High	600 (construction only)	4, 23
Implement seasonal land application of Deer Lodge municipal wastewater	City of Deer Lodge	High	405 (construction only)	4, 24
Adopt basin-wide phosphorus detergent bans	Municipalities, Counties	High	Low	1
Secure long-term protection for instream flows in the Clark Fork River	Upper Clark Fork Basin Steering Committee	High	Unknown	Unknown
Enforce an aggressive nondegradation policy with respect to nutrient sources	MDHES	High	_____	27
Establish numeric nutrient loading targets for the Clark Fork River and implement the TMDL wasteload allocation process if voluntary nutrient control measures are unsuccessful.	MDHES	High	50-500 (development of TMDL only)	1, 2, 27
Require nutrient monitoring as a condition of all wastewater discharge permits	MDHES	High	Low	29
Change nutrient limits for Stone Container Corp. to include surface and subsurface discharges	MDHES	High	_____	27, 29
Implement nutrient removal or alternative disposal methods for Butte municipal wastewater treatment facility	City of Butte	Medium	Unknown	4, 25, 26
Evaluate and implement additional measures to curb municipal and industrial wastewater nutrient discharges	Municipalities, Industries	Medium	Unknown	1, 28, 29
Organize wastewater discharge permits on a concurrent, five-year cycle	MDHES	Medium	_____	27

MANAGEMENT OBJECTIVE: Control Nuisance Algae in the Clark Fork River by Reducing Nutrient Concentrations.

NONPOINT SOURCE CONTROLS

Management Action	Lead Agency	Priority	Cost (thousands)	Funding Source(s)
Develop and implement a nonpoint source management plan specifically for the Clark Fork Basin	MDHES	High	1000	1, 3
Identify and control sources of nutrients in Mission and Crow creeks, Coleman Coulee, and the Little Bitterroot River	Confederated Salish and Kootenai Tribes	High	50 (Identification only)	1, 3, 27
Identify and control sources of nitrogen in the Dempsey, Lost, Mill, Willow and Racetrack creeks drainages.	MDHES	High	25 (identification only)	1, 3
Control groundwater sources of nitrogen loading to the Bitterroot River.	Missoula County, City of Missoula	High	Unknown	Unknown
Modify irrigation practices in the Gold Creek drainage to reduce phosphorus loading	Powell County, MDHES	Medium	Unknown	Unknown
Implement additional nonpoint source reclamation demonstration projects in the Clark Fork Basin	MDHES	Medium	Unknown	3
Identify nonpoint sources and causes of water quality impairment in the Blackfoot River drainage	MDHES, USFS, BLM, etc.	Medium	100	3
Implement the use of the Blackfoot Geographic Information System in nonpoint source pollution control	EPA, MDHES	Medium	50 - 100	1, 3
Implement the use of the Clark Fork Geographic Information System in nonpoint source pollution control	MDHES	Medium	50 - 100	1,3
Evaluate sources of nitrogen in Fish Creek, Trout Creek and the Bull River	MDHES	Low	10	1

MANAGEMENT OBJECTIVE: Protect Pend Oreille Lake Water Quality by Maintaining or Reducing Current Rates of Nutrient Loading from the Clark Fork River

POINT SOURCE CONTROLS

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Require nutrient monitoring as a condition of all wastewater discharge permits	IDEQ, MDHES, EPA	High	1,000 annually per discharger	28, 29
Enforce an aggressive antidegradation policy with respect to nutrient sources	IDEQ, MDHES, EPA	High	N.A.	27
Establish numeric nutrient loading targets for Pend Oreille Lake and implement a nutrient allocation strategy if voluntary nutrient control measures are unsuccessful in protecting water quality	IDEQ, MDHES, EPA	High	40,000 (development only)	1, 2, 3

MANAGEMENT OBJECTIVE: Reduce Nearshore Eutrophication in Pend Oreille Lake by Reducing Nutrient Loading from Local Sources.

POINT SOURCE CONTROLS

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Implement nutrient removal or alternative disposal methods for Kootenay-Ponderay municipal wastewater	IDEQ, Local Sewer District	High	30,000 (evaluation only)	8, 28
Require nutrient monitoring as a condition of all wastewater discharge permits	IDEQ, EPA	High	1,000 annually per discharger	28, 29
Enforce an aggressive antidegradation policy with respect to nutrient sources	IDEQ, EPA	High	N.A.	27
Establish numeric nutrient loading targets for Pend Oreille Lake and implement a nutrient allocation strategy for Pend Oreille Lake if voluntary nutrient control measures are unsuccessful in protecting water quality	IDEQ, MDHES, EPA	High	40,000 (development only)	1, 2, 3

NONPOINT SOURCE CONTROLS

Education

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Prepare brochures to support recommended ordinances and provide a clearinghouse for information to interested and concerned lake and watershed users.	Clean Lakes Council, Tri-State Council	High	60,000 annually	1, 2, 5

MANAGEMENT OBJECTIVE: Reduce Nearshore Eutrophication in Pend Oreille Lake by Reducing Nutrient Loading from Local Sources (continued).

Septic Systems

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Install centralized sewage treatment systems in developed areas	IDEQ, PHD, Local Sewer Districts	High	Cost dependent on site	1, 4, 8
Identify areas and zone for more dense development with centralized sewage treatment systems	Bonner County, PHD, SCS	High	Unknown (Low)	12
Periodic mandatory maintenance and operation inspections of septic systems	PHD, Local Sewer Districts	Medium	25,000 annually	13

Stormwater

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Implement a county stormwater management plan	Bonner County, PHD, IDEQ	High	15,000 (development only)	1, 2, 3, 12

Fertilizer Use

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Implement a county ordinance prohibiting the sale of phosphate lawn fertilizers	Bonner County, IDEQ	Medium	2,000 (development only)	1, 2, 12
Develop BMP's for methods and rates of application of fertilizers based on soil type and slope	Bonner County, SCS	Medium	10,000	1, 2, 3
Implement a county ordinance requiring fertilizer BMP's within a lake or stream protection zone	Bonner County	Medium	2,000 (development only)	2, 12

MANAGEMENT OBJECTIVE: Reduce Nearshore Eutrophication in Pend Oreille Lake by Reducing Nutrient Loading from Local Sources (continued).

Development and construction

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Implement an county erosion control plan	Bonner County, IDEQ	High	15,000 (development only)	1, 2, 3, 12
Amend zoning ordinances to set residential density based on land and lake capabilities	Bonner County, SCS, IDEQ	High	Unknown (Low)	12
Amend zoning ordinances to restrict development in environmentally sensitive and unstable areas	Bonner County, SCS	Medium	Unknown (Low)	12
Increase set backs between development and watercourses	Bonner County, IDEQ	Medium	Unknown	12
Allow individuals and developers to design erosion control plans based on soil type and slope	Bonner County, IDEQ	Medium	30,000 annually	12, 13

Road construction

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Implement road construction and maintenance BMP's specific to Pend Oreille Lake watershed and develop a Memorandum of Understanding with Bonner County Road Department	Bonner County, IDEQ	High	10,000 (development only)	1, 2, 3
Review travel corridor construction proposals within the Pend Oreille Lake watershed	IDEQ, ITD	High	N.A.	27

Agriculture

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Identify and control sources of nutrients in Pack River and Sand Creek	IDEQ, SCD	High	30,000 (identification only)	1, 2, 7

MANAGEMENT OBJECTIVE: Reduce Nearshore Eutrophication in Pend Oreille Lake by Reducing Nutrient Loading from Local Sources (continued).

Forest practices

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Implement a cooperative road management program with federal, state, and private landowners	IDL	High	Unknown	3
Increase personnel for enforcement of the Forest Practices Act and operator training	IDL	Medium	60,000 annually per new hire	Unknown
Encourage nomination of stream segments of concern to develop site specific BMP's		Medium	N.A.	6

Metals toxicity

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Technically review proposed mining activities in the basin	IDEQ, IDL	High	N.A.	27
Implement a metals toxicity monitoring program	IDEQ	Medium	Unknown	Unknown
Complete a health risk assessment based on available literature	IDHW, PHD	Medium	30,000	Unknown

Motorized watercraft use

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Require marinas to install pump-out stations	Bonner County	High	Unknown	13
Enforce the no sewage discharge standard	County Marine Division's	High	N.A.	Unknown
Implement a ban on phosphate detergents to clean watercraft	Bonner County, IDEQ	High	1,000 (development only)	1, 2, 12

MANAGEMENT OBJECTIVE: Reduce Nearshore Eutrophication in Pend Oreille Lake by Reducing Nutrient Loading from Local Sources (continued).

Shoreline Burning

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Implement a county ordinance prohibiting shoreline burning	Bonner County, IDL	Medium	2,000 (development only)	1, 2, 12

Aquatic Macrophytes

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Selective removal of aquatic plants by hand	Bonner County, Private	Low	100-1,500 for hand-held cutter	12, 13
Remove aquatic plants periodically using mechanical harvesting	Bonner County	Low	500-800 per acre biannually	12
Cover lake bottom with fabric barrier	Bonner County, private	Low	0.06-1.25 per sq. ft. with annual maintenance	12, 13

Environmentally sensitive or critical areas

Management Action	Lead Agency	Priority	Cost (dollars)	Funding Source(s)
Map environmentally sensitive areas with high water tables (wetlands)	COE, SCS	Medium	1,000	1, 12
Purchase or dedicate environmentally sensitive or critical areas		Low	Unknown	10, 11, 12, 13

MANAGEMENT OBJECTIVE: Improve Pend Oreille River Water Quality Through Macrophyte Management and Tributary Nonpoint Source Controls

Management Action	Lead Agency	Priority	Cost (thousands)	Funding Source(s)
Rotovation of milfoil in high use areas of the Pend Oreille River should continue, with additional emphasis on control of upstream pioneer colonies.	County, PUD	High	80K/year	1, 4, 16, 20
Purchase an additional rotovator to increase area coverage and enable alternative methods of harvesting, like strip rotovation.	County, PUD	High	135K	1, 4, 16, 18, 19, 20
Develop and maintain programs to educate the public on their role in preventing the migration of milfoil.	County, PUD, Ecology	High	10K/year	3, 4, 5, 16, 17, 18, 19
Resource managers should explore the possible use of harvested milfoil as a resource, in addition to herbicide application and biological agents as alternative milfoil controls.	County, PUD	Medium		1, 16, 18, 20
Tributaries exhibiting water quality problems from nonpoint sources should be referred to the Conservation District for additional sampling (if necessary), followed by BMP development and implementation.	Conservation District	High		3, 4, 17, 21
Grants secured by the Conservation District for BMP implementation should include post implementation monitoring to evaluate effectiveness of nonpoint source controls.	Conservation District	Medium		3, 4, 17, 21
As a general guideline, total phosphorus should not exceed 50 μg P/L in any tributary of the Pend Oreille River, nor 25 μg P/L within Box Canyon Reservoir.		Low		Unknown

MANAGEMENT OBJECTIVE: Improve Pend Oreille River Water Quality Through Macrophyte Management and Tributary Nonpoint Source Controls (continued).

Management Action	Lead Agency	Priority	Cost (thousands)	Funding Source(s)
Pend Oreille County should establish a local watershed management committee fashioned after the "nonpoint rule" (WAC 400-12).	County	High	40K	3, 4, 17, 19, 20
Pend Oreille County should form and manage a citizen monitoring program to gather current land use information in the Pend Oreille River Basin.	County	High	10K	3, 4, 17, 19
Ecology should maintain the Pend Oreille River at Newport as a core monitoring station and re-establish Metaline Falls as a rotating station to be sampled one year of every three.	Ecology	Medium	2K/year	1, 22
Pend Oreille River resource managers should utilize a GIS system for management of basin water resource data.	PUD, County	Medium	15K/year plus equipment	1, 19, 20

ABBREVIATIONS

BLM	U.S. Bureau of Land Management
COE	U.S. Corp of Engineers
EPA	U.S. Environmental Protection Agency
IDEQ	Idaho Division of Environmental Quality
IDHW	Idaho Department of Health and Welfare
IDL	Idaho Department of Lands
ITD	Idaho Transportation Department
MDHES	Montana Department Health and Environmental Sciences
N.A.	Not Applicable. Implementation is possible under current programs.
PHD	Panhandle Health District
SCD	Soil Conservation District
SCS	U.S. Soil Conservation Service
TMDL	Total Maximum Daily Load
USFS	U.S. Forest Service

FUNDING SOURCES *All funding sources are **possible funding sources.** No commitment for funding has been received from of any of the identified sources.*

1	Clean Water Act Section 525 Reauthorization
2	Clean Water Act Section 314 (Clean Lakes Program)
3	Clean Water Act Section 319 (Nonpoint Source Program)
4	State Revolving Fund
5	National Environmental Education Act
6	Idaho Antidegradation Policy
7	Agricultural Water Quality Management Program
8	Municipal Facilities Construction Grants Program
9	(Reserved)
10	Habitat Improvement Program (Idaho)
11	Forest Stewardship Program
12	Bonner County, Idaho
13	private landowner
14	(Reserved)
15	(Reserved)
16	Corps of Engineers Eurasian Watermilfoil Control Grants
17	Centennial Clean Water Fund (Washington)
18	Freshwater Weeds Account (Washington)
19	Pend Oreille County, Washington
20	Pend Oreille County Public Utility District, Washington
21	Pend Oreille Conservation District, Washington
22	State General Fund (Washington)
23	City of Missoula, Montana
24	City of Deer Lodge, Montana
25	City of Butte, Montana
26	Superfund Program
27	Clean Water Act Section 106 Funds
28	Municipalities
29	Industries/Dischargers

Taking the First Steps: Priorities for Action

Recognizing that it would be difficult to immediately implement all of the management actions outlined in the Management Matrixes, the Steering Committee has identified the following actions to be of the highest priority.

- ***Convene a Tri-State Implementation Council to implement the Management Plan recommendations.***

The Clark Fork-Pend Oreille Basin Water Quality Steering Committee is committed to working with the appropriate agencies and groups to convene a Tri-State Implementation Council to implement the management actions outlined in the plan. The Council should include representatives from federal, tribal, state and county agencies, along with citizens and special interest groups. The Council could also include representation from the suggested local watershed management committee in Pend Oreille County. (One of the management recommendations for improving Pend Oreille River water quality is the establishment of a local watershed committee fashioned after the Washington "nonpoint rule.") Since most of the recommended actions must be implemented at the local level, the Steering Committee recommends that the local agencies, tribes and other locally-based interest groups have a large role in the Council.

In particular, the Council should include or consult with all interested and affected Indian Tribes in the Clark Fork-Pend Oreille Basin and should ensure that the appropriate tribes be included in the planning and use of any funds allocated for water quality monitoring of reservation waters as well as other activities that

are necessary to implement the Clark Fork-Pend Oreille Basin Water Quality Management Plan.

There are several federally recognized Indian Tribes in the basin and many are developing resource management capabilities. Some have received federal "treatment-as-a-state" status under the federal Clean Water Act which makes them eligible to accept responsibility for developing and managing water quality programs. In addition, some of the Idaho and Washington tribes have formed the Upper Columbia United Tribes fishery research center with offices in Wellpinit, Washington, and on the campus of Eastern Washington University in Cheney.

Tribes likely to be most affected by this Management Plan are the Confederated Salish and Kootenai Tribes of the Flathead Indian Reservation in western Montana and the Kalispel Tribe in Washington. Several miles of the Kalispel Reservation are located directly on the banks of the Pend Oreille River. The Flathead River flows through the Flathead Reservation and contributes substantially to the nutrient loading in the lower Clark Fork River. Other tribes, such as the Spokane Tribe and the Colville Confederated Tribes in Washington and the Coeur d'Alene Tribe of Idaho, may not be directly affected by implementation of the plan but may have cultural interests or aboriginal territories in the Clark Fork-Pend Oreille Basin. The Council should be sure to keep these tribes apprised of its activities and decisions.

The Council would have various roles and responsibilities. These include, but may not be limited to, the following: building strong citizen, community and agency support for the plan; coordinating the activities of the various agencies implementing the plan; developing timetables; identifying funding; establishing budgets; securing agreements among agencies; establishing criteria for success; identifying or revising priority recommendations; communicating with appropriate groups as needed (e.g., the Upper Clark Fork Basin Steering Committee); and providing a forum for public input and support. The Council itself would not have

any regulatory or enforcement authority beyond the authorities of the individual agencies represented on the Council.

- ***Establish a basin-wide phosphate detergent ban.***

Studies by the University of Montana concluded that management of both nitrogen and phosphorus could reduce nuisance algal levels in the Clark Fork River and would be important in protecting reaches without current problems. Idaho researchers concluded that phosphorus is the primary nutrient controlling algal and plant growth in Pend Oreille Lake. In addition, the Montana Governor's Office in its 1988 Clark Fork Basin Project Status Report and Management Plan stated that "Regulatory agencies, industries, municipalities, and public interest groups should work to reduce all forms of nutrient loading to the Clark Fork Basin."

Phosphate in detergents is the source of much of the phosphorus discharged by municipal treatment plants, and approximately half of all soluble phosphorus loading to the Clark Fork River originates from wastewater discharges. Bans on the sale of high phosphate detergents are already in effect in Montana in the Flathead River Basin and in the communities of Missoula, Superior and Alberton. Bonner County, Idaho has also adopted a phosphate detergent ban. These actions have been highly successful in reducing phosphorus discharges to the Clark Fork River from the respective municipal wastewater treatment facilities. For example, the phosphate detergent ban that was implemented by the City of Missoula in May 1989 has resulted in greater than a 40 percent reduction in phosphorus loading to the Clark Fork River from the Missoula wastewater treatment plant. Concentrations of phosphorus in the river downstream from this facility have subsequently declined by a large margin. A modeling study conducted by the University of Montana predicted a reduction in algal standing crops in 110 miles of the Clark Fork River as a direct result of this action.

It seems clear that there have been very tangible water quality benefits associated with the elimination of the sale of phosphate detergents in Missoula. Therefore, the Steering Committee strongly recommends the adoption of similar bans in other basin communities. Adoption of bans at Butte and Deer Lodge, Montana, could achieve a 10 percent reduction in soluble phosphorus loading to the upper Clark Fork River during summer. Adoption of bans at all remaining communities would have even greater cumulative effects and could reduce annual loading of soluble phosphorus to Pend Oreille Lake by five percent or more.

Low phosphate and phosphate free soap products are readily available to consumers and their effectiveness is not substantially different from high phosphate detergents.

- ***Establish numeric nutrient loading targets for the Clark Fork River and Pend Oreille Lake.***

The Steering Committee has recommended the following targets for instream concentrations of phosphorus and nitrogen in order to attain the stated water quality objectives:

- Six micrograms per liter or less of soluble phosphorus and 30 micrograms per liter or less of soluble nitrogen in Clark Fork River.
- Two micrograms per liter of soluble phosphorus and five micrograms per liter of total phosphorus in Pend Oreille Lake.
- Fifty micrograms per liter of total phosphorus in several tributaries of the Pend Oreille River.
- No special instream conditions are warranted for the mainstem Pend Oreille River.

In order to meet these instream concentration targets of nutrients, it would be necessary to establish numeric loading targets for various reaches of the Clark Fork River and Pend Oreille Lake. Loads would then be allocated among the

various sources contributing nutrients to those reaches. These numeric loading targets and the associated nutrient source allocations would not have to be regulatory but would provide voluntary reduction targets for the various point and nonpoint sources in the basin.

The Steering Committee recommends a voluntary approach to nutrient controls and pollution reduction in the Clark Fork-Pend Oreille Basin. However, Montana and Idaho would consider the application of mandatory wasteload allocations if voluntary measures fail to achieve the desired results.

- ***Develop and maintain programs to educate the public on their role in protecting and maintaining water quality.***

All three individual state plans as well as the overall Basin Management Plan put a high priority on public education. A comprehensive and well targeted public education program should have three main messages or components. First, inform watershed users how their activities directly affect the body of water that they depend on and value. The Steering Committee views this message as one of the most effective methods of reducing the amount of nutrients that enter the water. This component should include education about proper fertilizer and pesticide application, proper maintenance of septic tank systems, better agricultural and livestock management practices, and the benefits of low phosphate products.

Second, the public education program should clearly articulate water quality goals and benefits of improving and protecting water quality. Users and residents may be more willing to modify their activities to meet water quality goals that they understand. Third, the program should educate the public about the need for and benefits of any management action that is selected for implementation as a means of building public support for the action. For example, the public should be informed of the need for and benefits associated with stormwater and erosion

control plans and how these plans would help to achieve the stated water quality goals.

Public education should begin before implementation, but it is particularly critical during implementation. Often nuisances are created and water uses are restricted while restoration is in progress. Examples would be shoreline stabilization, weed harvesting and stormwater improvements. People typically respond positively when they understand what is occurring and why, and react negatively when they are uninformed.

- ***Control Eurasian watermilfoil by education, rotovation, and research into alternative methods.***

The primary problem afflicting Pend Oreille River water quality is pervasive milfoil. Rotovation, as the most effective management tool, should continue in high use areas of the river and an additional rotovator should be purchased to double the amount of weed beds cleared. Since harvested aquatic plants could have beneficial uses, resource managers should investigate alternatives to disposing of the harvested weeds on the banks of the river (e.g. using harvested materials as compost).

Local water quality managers may be able to experiment with herbicide control of milfoil, with projected state and federal technical and financial assistance. Biological agents, particularly aquatic insects and fungi, the subject of ongoing research, may also be an additional management method for the future.

To date, Eurasian watermilfoil is a problem only in the Pend Oreille River portion of the Clark Fork-Pend Oreille Basin. Milfoil is an invasive and adaptable plant that needs to be aggresively managed to prevent its spread into other parts of the basin. One of the primary means of spreading milfoil is by boaters. The milfoil is transported on the hulls of boats as boaters move from waterbody to

waterbody. Therefore, educating boat owners on how they can help prevent the spread of milfoil is crucial.

- ***Install centralized sewer systems as part of development activities on Pend Oreille Lake.***

The Steering Committee recommends sewering in areas around Pend Oreille Lake that are experiencing development pressures. Prime high density development areas should be identified and zoned as such. Installation of centralized sewer systems in these high density development zones should be required before construction when the number of homes or commercial sites to be developed will exceed a specified number of septic systems. The specified number should be based on soil type and slope. Existing septic systems in developed areas should be replaced with centralized sewer systems, but only when technically or economically feasible.

Sewering will soon be underway at Hope and East Hope, Idaho. The Steering Committee recommends that LaClede, Clark Fork and Trestle Creek be targeted as the next areas for installation of centralized sewer systems.

- ***Institute seasonal land application and other improvements at the Missoula municipal wastewater treatment facility.***

Utilization of treated municipal wastewater for agricultural irrigation is one potentially beneficial alternative for reducing the discharge of nutrients and other pollutants to surface waters. Most of the water quality problems associated with nuisance levels of algae in the Clark Fork River occur during the summer. During this period, the largest share of nutrients that feed the algae come from wastewater discharges.

If the entire volumes of municipal wastewater from the Deer Lodge and Missoula municipal wastewater treatment facilities were utilized for irrigation

purposes during the months of July through September, summer nutrient loading to the upper and middle reaches of the Clark Fork River could decrease by as much as 30 and 70 percent, respectively. Nutrient concentrations in the reaches of the river below these discharges would decline by as much as 70 percent or more. Target levels would be achieved for phosphorus and nitrogen in the middle Clark Fork River and for phosphorus in the upper Clark Fork River. Lastly, annual reductions in soluble nutrient loading to Pend Oreille Lake of from 3-10 percent could be realized. Implementation of this alternative could reduce current summer algal levels in 200 or more miles of the Clark Fork River.

The City of Missoula has evaluated the opportunities for land application of its municipal wastewater. While a number of precautions are necessary, and legal issues relative to downstream water rights have not yet been explored, land application appears to be a viable option. Sewer rate increases of 31 percent were projected in order to utilize land application, therefore strong support of this alternative by the citizens of Missoula would be necessary for implementation.

- ***Better enforcement of existing regulations and laws, in particular states' anti-degradation language.***

A nutrient control strategy for the Clark Fork-Pend Oreille Basin logically should consider and build upon the pollution control measures that are already in place. A number of programs, statutes, regulations, and planning efforts are in effect now or will be implemented in the near future. There are too many to list here and many are identified in the individual state plans, but some examples include the NPDES program for control of point source discharges; the Nonpoint Source Pollution Control Program which requires states to establish a framework for controlling nonpoint sources; Tribal Water Quality Programs which are developing comprehensive water quality management plans; Idaho's Nutrient

Management Act; the Upper Clark Fork River Basin Management Plan; and Washington's Aquatic Plant Management Program.

A notable and important existing program is each state's Nondegradation Rules. The Nondegradation Rules are part of each state's water quality standards and apply to new or increased sources of pollution. The specific nondegradation language is different in each state's laws. Generally, however, nondegradation requirements state that if existing water quality is better than that which is necessary to support the designated uses of the waterbody as defined in the water quality standards, that level of water quality must be maintained. Montana, in particular, should enforce a consistent and aggressive policy of nondegradation, with respect to nutrient loading from new and enlarged point source discharges, because of the well-documented water quality problems in the Clark Fork River. It should be noted that MDHES has proposed legislative changes to the nondegradation statute in order to clarify its intent and ensure its consistent application.

One of the first steps that the Council should take to enforce existing authorities is to compile a list of all pertinent laws and the agencies responsible for their enforcement. From there, the issues and problems associated with their enforcement should be identified and this information distributed to all appropriate agencies.

- ***Establish and maintain a water quality monitoring network to monitor effectiveness and trends and to better identify sources of pollutants.***

Preliminary instream nutrient targets for the Clark Fork River, Pend Oreille Lake, and tributaries to the Pend Oreille River have been proposed in this report. A continuing basin-wide monitoring program to evaluate progress towards achievement of these target concentrations will be an essential component of a successful nutrient control strategy.

Presently all three states have some fixed station monitoring sites in the basin. MDHES has maintained a network of fixed monitoring stations throughout the Clark Fork River drainage since 1985. Idaho DEQ has contracted with the USGS to continue monitoring tributaries and outflows of Pend Oreille Lake. Washington maintains a routine monitoring station on the Pend Oreille River at Newport. As long as funding remains available, all three states plan to continue these programs in order to provide the needed information to assess trends in nutrient concentrations and loads throughout various areas of the basin and to evaluate overall progress toward water quality goals.

However, these programs will need to be expanded, or separate programs initiated, to monitor the successful implementation and effectiveness of individual management actions basin-wide. Anytime an implementation project is funded and initiated, a portion of the project budget should be set aside for water quality monitoring before and after implementation to evaluate the project's effectiveness.

In addition, citizen volunteer monitoring programs should be initiated or modified as appropriate to collect information that would be useful to assess long term trends or to provide information that is not available elsewhere. For example, information on current land use in Pend Oreille County is needed. Available information is over 20 years old. Detailed land use information would be a significant contribution to the refinement of the watershed management plan.

Finally, the Steering Committee recommends that a larger Clark Fork-Pend Oreille Basin GIS System be developed and maintained by an appropriate agency or group of agencies.

- ***Develop and enforce stormwater control and erosion control plans and county ordinances.***

Due to increased population and development around Pend Oreille Lake, the Steering Committee recommends that the Tri-State Council work with Bonner

County to incorporate stormwater and erosion control plans during the current updating of the county's comprehensive plan. The recently completed Kootenai County erosion control plan could be used as a model and revised as appropriate for Bonner County.