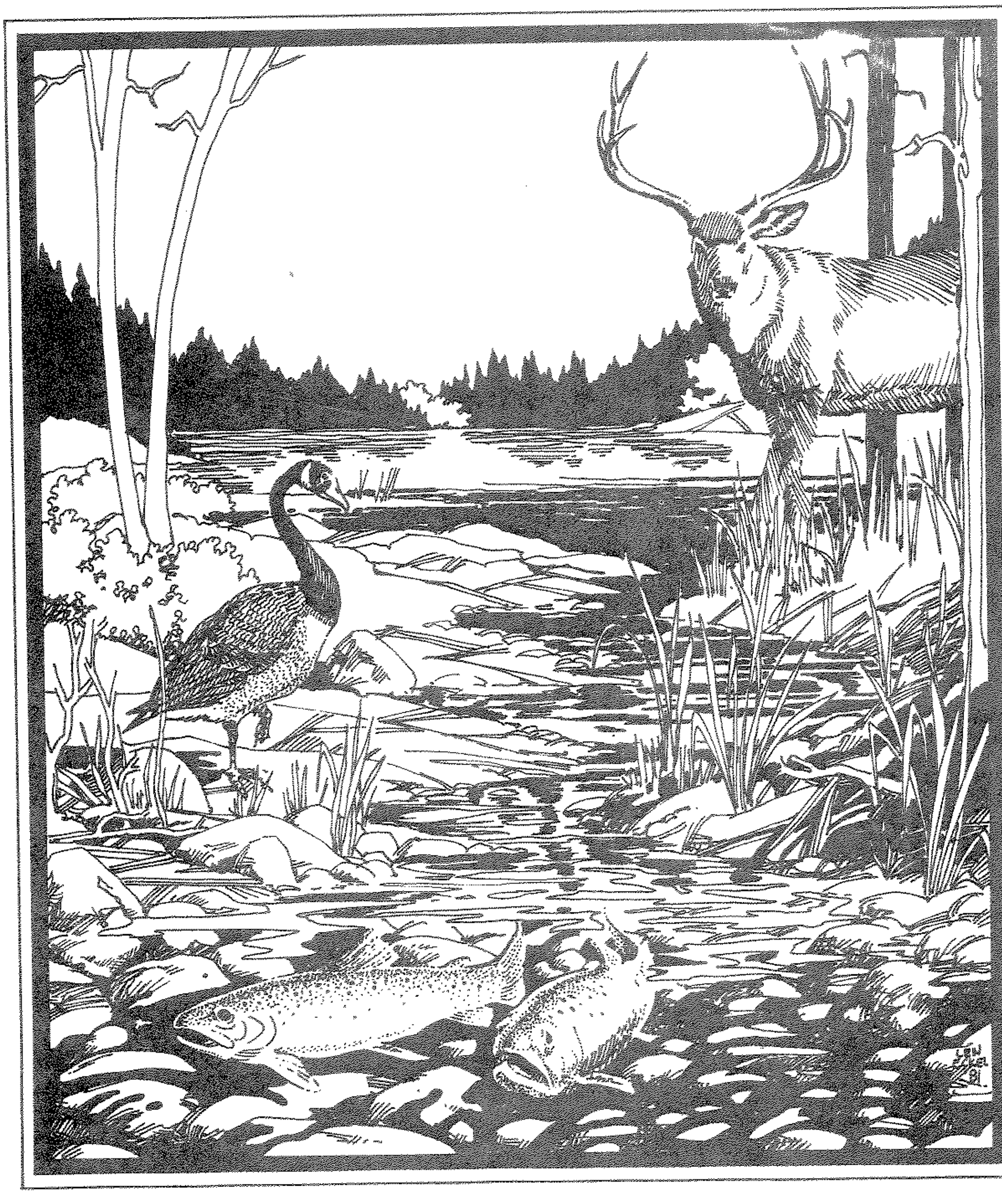
MONTANA

Recommendations For Fish & Wildlife Program



Submitted To

Pacific Northwest Electric Power And Conservation Planning Council

MONTANA

Recommendation for Fish and Wildlife Program

Submitted to:

PACIFIC NORTHWEST ELECTRIC POWER AND CONSERVATION PLANNING COUNCIL

Submitted by:

James W. Flynn, Director
Montana Department of Fish
Wildlife and Parks

Tom Pablo, Chairman
Confederated Salish and
Kootenai Tribes

Wally Steucke
Area Manager
U.S. Fish and Wildlife
Service

November, 1981

MONTANA

RECOMMENDATIONS FOR A FISH PROGRAM

Prepared by:

Patrick Graham   Russ Penkal   Steve McMullin   Phil Schladweiler
Montana Fish, Wildlife and Parks

And

Herschel Mays   Victor Riggs   Robert W. Klaver
Confederated Salish and Kootenai Tribes

Advisory Committee Members:

Montana Fish, Wildlife and Power Ad Hoc Committee

Confederated Salish and Kootenai Tribes	Herschel Mays Victor Riggs
Bureau of Indian Affairs	Jim Claar
Montana Power Company	Frank Pickett Larry Gruel
Washington Water Power Company	Roger Woodworth
Pacific Power & Light Company	J.A.R. Hamilton
Bureau of Reclamation	Dick Woodworth
Army Corps of Engineers	Jack Thompson Tom Bonde
U.S. Fish and Wildlife Service	Larry Lockard
Western G & T	James Sewall Steve Herndon
Montana Fish, Wildlife and Parks	Patrick Graham, Chairman Dennis Workman Art Whitney Larry Peterman

STATE OF MONTANA

DEPARTMENT OF

FISH AND GAME

POSITION STATEMENT OF THE
MONTANA DEPARTMENT OF FISH, WILDLIFE, AND PARKS

Headwater streams from three great river systems drain Montana, including the Columbia, Missouri, and Saskatchewan rivers. The over 26,000 square miles of Western Montana which drain into the Columbia, contain 5,290 miles of trout streams and rivers and over 820 lakes and reservoirs.

Many of the major sport fish in Western Montana streams and lakes are migratory. Migrations of westslope cutthroat trout and trophy-sized bull trout cover over 100 miles in the Flathead River system to reach their spawning grounds. These migratory populations provide important recreation for Montanans and their visitors.

Western Montana supports a diversity of wildlife including grizzly bears, mountain goats, moose, harlequin ducks, river otter and numerous other game and non-game species. Many forms of wildlife also use a variety of habitat seasonally to sustain their population size. Riparian vegetation and valley meadows are important to most forms of wildlife.

Construction of hydroelectric projects on these river systems, while providing energy and flood control, has generally resulted in a negative impact on fish and wildlife by blocking migrations and changing or eliminating habitat. For the most part these impacts have gone unmitigated. A balance must be reached to insure an adequate, reliable, and cost-effective power supply while insuring these impacts on fish and wildlife are adequately mitigated.

The advent of the Regional Power Act has brought a long needed mechanism to provide stable energy planning for the Pacific Northwest. One important aspect of this legislation is the development of a fish and wildlife program in recognition of the impact hydroelectric development has had on fish and wildlife throughout the Columbia River basin and beyond. This should include addressing the cummulative impact of energy development on fish and wildlife and the insurance of adequate protection for those resources which cannot be mitigated or replaced.

The cooperative process which produced this document must be continued to insure that an effective and agreeable program is developed. Montana's unique natural resources now more than ever must be recognized for they do truly represent the last of what is best.

James W. Flynn
Director
Montana Department of Fish, Wildlife, and Parks

THE CONFEDERATED SALISH AND KOOTENAI TRIBES
OF THE FLATHEAD RESERVATION

FLATHEAD NATION

Box 278
Pablo, Montana 59855
(406) 675-2700

Fred Houle, Jr. - Executive Secretary
Vern L. Clairmont - Executive Treasurer
Al Hewankorn - Sergeant at Arms

TRIBAL COUNCIL MEMBERS:
Thomas E. Pablo - Chairman
Laurence. Kenmille - Vice-Chairman
Victor L. Stinger - Tribal Secretary
Joseph F. McDonald - Tribal Treasurer
Louis Adams
John McClure
E.W. Morigeau
Sonny Morigeau
Noel Pichette
Thomas Swaney

POSITION STATEMENT OF THE CONFEDERATED SALISH AND KOOTENAI TRIBES

The Confederated Salish and Kootenai Tribal Council provides the direction needed to manage all tribal resources within the exterior boundaries of the Flathead Indian Reservation. Because of the importance of proper tribal resource management and an ever increasing demand on the resource of the lower Flathead River and Flathead Lake, it is essential to recognize the needs and concerns of the tribal people and the residents of Montana. Tribal resources will be managed for both energy production and fish, wildlife and recreation.

The lower Flathead River and the south half of Flathead Lake have been historically and still are a nucleus for the Indian people's cultural, physical and economic needs. The Tribes believe that recreational, cultural and historical resources are of equal importance to fish and wildlife resources. They also believe the Pacific Northwest Power and Planning Conservation Act itself implies their importance. Subsistence hunting and fishing are culturally and economically important to the Salish and Kootenai people.

To fulfill the Tribes' obligations to protect and enhance the wildlife and fisheries that may be affected by the Pacific Northwest Power Act, a thorough resource inventory and investigation of fish, wildlife and recreation use are needed. Currently, the Tribes lack information on the effects of the operation of Kerr Dam which are needed to establish guidelines to effectively maximize fisheries/wildlife protection and at the same time optimize power production. It is the intention of the Tribes to pursue the funding for studies necessary to fill these important needs.

Thomas E. Pablo, Chairman
Tribal Council

ACKNOWLEDGEMENTS

Council members Keith Colbo and Gerald Mueller provided the catalyst for the development of the Montana Fish, Wildlife and Power Ad Hoc Committee and support funding for staff to coordinate the development of these recommendations. However, they have not been directly involved in developing the recommendations.

A number of people have assisted in preparing this document. Department of Fish, Wildlife and Parks biologists that assisted in providing information and review included Art Whitney, Jim Posewitz, Gene Allen, Dennis Workman, Bob Schumacher, John Firebaugh, Dick Weckworth and their staffs. Review and editing was also provided by James Claar, wildlife specialist, and David Rockwell, recreation planner for the Bureau of Indian Affairs, and Larry Lockard, U.S. Fish and Wildlife Service. Leo Berry, Director of the Department of Natural Resources and Conservation and his staff reviewed the draft and final recommendations.

Steve Leathe provided much needed assistance compiling comments, review and editing in the final stages of preparation. Mike Aderhold and Steve Leathe assisted in conducting the four public meetings. Committee members provided constructive criticism and information at all stages in development of these recommendations. Their open and positive approach is to be commended.

The Confederated Salish and Kootenai Tribes wish to acknowledge the cooperation and assistance which they received from other agencies and individuals in the development of this paper. In particular, we would like to thank the Wildlife Branch of the Bureau of Indian Affairs, Patrick Graham of the Montana Department of Fish, Wildlife and Parks, U.S. Fish and Wildlife Service, Bonneville Power Administration, and Montana Power Company.

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INTRODUCTION

REGIONAL POWER PLANNING ACT

Passage of the Pacific Northwest Electric Power Planning and Conservation Act (PL96-501) by Congress in 1980 marked the beginning of a new era for regional energy planning. The Act called for the establishment of a Regional Power Planning Council with two representatives, each from Washington, Oregon, Idaho and Montana. This Council has two years to develop a regional energy plan. Background information on the legislation and Council is provided in Appendix A.

One significant aspect of the Act was the emphasis it placed on protection, mitigation and enhancement of fish and wildlife that have been affected by hydroelectric development on the Columbia River and its tributaries. The Act requires the Council to develop a fish and wildlife program to address these impacts prior to completion of the energy plan.

On 10 June 1981, the Council issued a call to State and Federal fish and wildlife agencies and Indian tribes for recommendations of measures to be considered in development of the Fish and Wildlife Program. These groups had until 15 November 1981 to submit their recommendations. Although the Act emphasizes anadromous fish (ie. sea-run salmon and trout), it specifically addresses resident fish and wildlife.

The geographic area specified for the Fish and Wildlife Program includes the Columbia River and its tributaries. This would include that portion of Montana west of the Continental Divide, approximately 26,000 square miles.

The specific language from the Act dealing with the fish and wildlife program is presented in Appendix B. Recommendations would include:

1. Measures that "can be expected to be implemented" by the Bonneville Power Administration to protect, mitigate and enhance fish and wildlife affected by Columbia Basin hydroelectric project construction and operation;

2. Establish objectives for development and operation of projects to protect, mitigate and enhance fish and wildlife;

3. Fish and wildlife management coordination and research to assist in protection, mitigation and enhancement at and between the region's hydroelectric dams.

The Council must develop and adopt the fish and wildlife program within one year after the time provided for receipt of the recommendations. The Council must insure that measures in the program meet the following criteria:

(a) complement the existing and future activities of the region's State and Federal fish and wildlife agencies and appropriate Indian tribes;

(b) be based on, and supported by, the best available scientific knowledge;

(c) utilized, where equally effective alternative means of achieving the same sound biological objective exist, the alternative with the minimum economic cost;

(d) be consistent with the legal rights of appropriate Indian tribes in the region; and

(e) in the case of anadromous fish -

  (i) provide for improved survival of such fish at hydroelectric facilities located on the Columbia River system; and

  (ii) provide flows of sufficient quality and quantity between such facilities to improve production, migration, and survival of such fish as necessary to meet sound biological objectives.

This fish and wildlife program will be developed along with the other purposes of the Act such as assuring the region an adequate, efficient, economical, and reliable power supply. Section 4(h)(11)(A) requires Bonneville Power Administration and other Federal agencies responsible for managing, operating, or regulating Federal or non-Federal hydroelectric facilities located on the Columbia River or its tributaries "in a manner that provides equitable treatment of such fish and wildlife" ..."taking into account at each relevant stage of decision making process to the fullest extent practicable, the program adopted by the Council."

DEVELOPMENT OF RECOMMENDATIONS

The Organization

On 25 June 1981, a meeting with Council members Keith Colbo and Gerald Mueller resulted in the formation of the Montana Fish, Wildlife and Power Ad Hoc Committee. Fish and Wildlife agencies, the Confederated Salish and Kootenai Tribes, and the operators of Western Montana's hydro projects agreed to work together in preparing recommendations for the fish and wildlife program.

Montana Department of Fish, Wildlife and Parks, the Confederated Salish and Kootenai Tribes and U.S. Fish and Wildlife Service worked together to prepare the recommendations. They agreed to submit a coordinated package with appropriate position statements and recommendations. They also agreed to work with the operating agencies and evaluate their comments and concerns throughout the review process.

Montana Power Company, Washington Water Power Company, Pacific Power & Light, U.S. Bureau of Reclamation, U.S. Army Corps of Engineers, representatives of the proposed Kootenai River Project, Bureau of Indian Affairs, and U.S. Forest Service participated in an active role by providing data and critical review of the draft recommendations, problem statements and project recommendations.

Process

A series of meetings of the Montana Fish, Wildlife and Power Ad Hoc Committee were held from June through September, 1981. Their purpose was to coordinate the development of goals, objectives and recommendations of measures to protect, mitigate and enhance fish and wildlife impacted by hydroelectric development in that portion of Montana draining into the Columbia River Basin.

Staff were provided by the Montana Department of Fish, Wildlife and Parks through funding by Montana's Council members Keith Colbo and Gerald Mueller. The staff collected information from sources within and outside the committee. They prepared a detailed list of goals and objectives and also drafts of problem statements, recommendations and justification were critically reviewed by the committee. This document is the result of that review process.

The Committee agreed that public involvement was an important element in this process. Four sites were selected in Western Montana to hold public meetings. These sites were Missoula, Noxon, Libby and Kalispell. The meetings were held October 5 through 8. Written comment was accepted at the meetings and for one week following. The committee chairman conducted the meetings explaining implication of the Act, the role of the Council and recommendations made for protection and mitigation of fish and wildlife. Written comments received following these meetings were positive and for the most part general in nature.

During this time period, committee members and other interested parties reviewed the document and made their written comments by October 16. A final document was sent to the committee members on October 23 for their review. Final position statements supporting the process and identifying areas of disagreement were required by October 30. These statements are contained in Appendix D of this document.

It was anticipated that not all issues would be resolved in this process. However, areas where agreement could be reached would facilitate development of a workable and effective fish and wildlife program. By approaching this opportunity in a cooperative nature, Montana has demonstrated its ability and desire to protect and mitigate its fish and wildlife resources while meeting the other purposes of the Act.

Development of recommendations was also coordinated with the Fish and Wildlife Ad Hoc Committee working primarily through the Resident Fish Committee. The numbers following the fishery recommendations in this document correspond to objectives developed by the Resident Fish Committee members Bill Nelson, Tony Elred, Jim Griggs, Herb Pollard and Pat Graham.

FLATHEAD RIVER BASIN

BASIN DESCRIPTION

Geography

The Flathead River Basin is the northeasternmost river basin in the Columbia River drainage. Three forks of the Flathead River, approximately equal in size, drain the west slope of the Continental Divide in northwest Montana and southeast British Columbia (Figure 1).

The North Fork Flathead River originates in the Canadian Rocky Mountains and flows south into Montana, forming the western boundary of Glacier National Park. All of the Montana portion of the North Fork is included in the National Wild and Scenic Rivers Program. For 40.7 miles from the Canadian border to Camas Creek, the North Fork is classified as a scenic river. The lower 17.6 miles from Camas Creek to the confluence with the Middle Fork is classified recreational.

The Middle Fork Flathead River originates in the Bob Marshall Wilderness Area. It flows in a generally northwest direction, forming the southwest boundary of Glacier National Park, until it joins the North Fork to form the main stem Flathead River. The entire length of the Middle Fork is included in the Wild and Scenic River Program. The upper 46.6 miles is classified wild. The lower 44.4 miles is classified recreational.

The South Fork Flathead River also originates in the Bob Marshall Wilderness. Its course generally parallels that of the Middle Fork. The South Fork empties into the Flathead River 9.6 miles downstream of the confluence of the North and Middle Forks. The lower five miles of the South Fork is regulated by Hungry Horse Dam, which impounds 35 miles of the South Fork. The South Fork from the headwaters of Hungry Horse Reservoir upstream to Spotted Bear (8.8 miles) is classified recreational. Above Spotted Bear, the South Fork is classified a wild river.

The upper Flathead River flows 55 miles from the confluence of the North and Middle Forks to Flathead Lake. The Flathead upstream of the mouth of the South Fork (9.6 miles) is classified recreational. The lower 45.4 miles is partially regulated by Hungry Horse and Kerr Dams (Kerr Dam backs water approximately 20 miles up the Flathead River).

Flathead Lake is the largest natural body of fresh water west of the Mississippi River, covering 126,000 acres. The lake is 28 miles long and five to 15 miles wide. Its only major tributary other than the Flathead River is the Swan River, which enters the lake's northeast corner.

The Swan River originates in the Mission Mountains and has a total length of 84 miles. A number of natural lakes are located on the Swan River, the largest of which is Swan Lake with a surface area of 2,680 acres. Bigfork Dam, a relatively small structure located 1.5 miles above the mouth of the Swan River, impounds approximately one mile of the river.

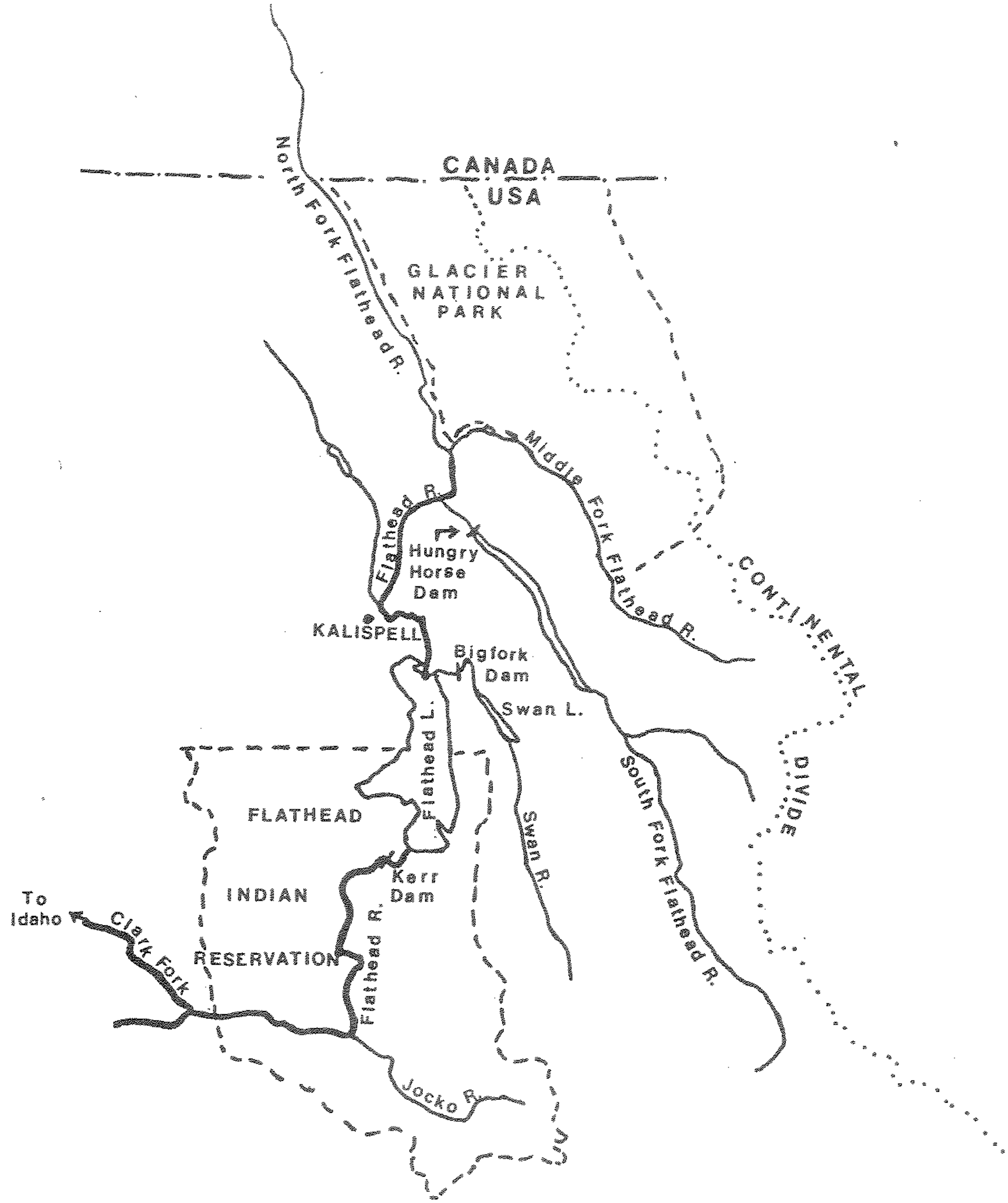

Figure 1. Map of Flathead River drainage.

The lower Flathead River drains Flathead Lake near Polson, Montana. The river flows 76.5 miles before emptying into the Clark Fork River near Paradise, Montana. Kerr Dam is located on the Flathead River 4.5 miles below the lake outlet. Kerr Dam adds a maximum of 10 feet of elevation to Flathead Lake.

Several potential hydroelectric sites are located on the lower Flathead River. Knowles Dam site is located at river mile (RM) 2.7. Other sites include Buffalo Rapids number four at RM 36.5, Sloan Bridge at RM 44, Buffalo Rapids number two at RM 61 and Moiese, located between Knowles and Buffalo Rapids number four.

Hydrology

The Flathead drainage is a water-rich basin, compared to other inland western river basins. The basin produces approximately 1,000 acre-feet of surface runoff per square mile of drainage area (Montana Department of Natural Resources and Conservation 1976). The drainage encompasses 8,446 square miles of which 7,096 square miles are located upstream of Kerr Dam (Montana Department of Natural Resources and Conservation 1977). Four hundred thirty-three square miles (five percent) of the basin is located in British Columbia.

Peak runoff normally occurs in May or June throughout the drainage. Water is stored in Hungry Horse Reservoir and Flathead Lake during the runoff period, dampening peak flows. Mean annual discharge and extremes for the Flathead River and major tributaries are listed in Table 1.

Seasonal discharge and temperature patterns in the North, Middle and upper South Forks reflect the climate of the upper basin. Minimum stream flows and water temperatures occur in winter. Ice formation is common. Peak temperatures normally occur in late July.

Flows in the lower South Fork are controlled by releases from Hungry Horse Dam. Flows normally range from 145 cfs to 10,000 cfs. Vertical water level fluctuations can be as much as eight feet. Water temperature of the lower South Fork is approximately 40° F year around because water passing the turbines at Hungry Horse Dam is taken from a great depth.

Hungry Horse Reservoir is one of the major storage projects in the Columbia system, storing 3,468,000 acre-feet of water for hydroelectric energy and flood control. The reservoir covers 23,750 acres and has a maximum depth of 500 feet. Surface temperatures normally approach 68° F in summer. Complete ice cover is common in winter.

The main stem Flathead River between the mouth of the South Fork and Flathead Lake is partially regulated by Hungry Horse Dam. Flow and temperature conditions result from the combined action of natural flows and temperatures in the North and Middle Forks and regulated flows and temperatures in the South Fork. Effects of regulation are least noticeable in spring, when natural stream flows are highest. Vertical water level fluctuations of up to five feet can occur in the main stem in fall and winter when natural flows are low. Main stem water temperature can be cooled as much as 14° F in summer and warmed as much as 7° F in winter due to peaking operations at Hungry Horse Dam (Graham et al. 1980b).

Table 1. Mean annual discharge and extremes for the periods of record at U.S. Geological Survey gauging stations on the Flathead River and major tributaries (U.S. Geological Survey 1980).

Station	Discharge (cfs)			1979 Temperature Range
	Mean	Maximum	Minimum	
North Fork near Columbia Falls	2,990	69,100	198	32-65
Middle Fork near West Glacier	2,948	140,000	<173	32-68
South Fork near Hungry Horse	3,571	46,200	7 1/	37-45
Flathead River at Columbia Falls	9,753	176,000	798	32-66
Whitefish River near Kalispell	192	1,580	4	32-76
Stillwater River near Whitefish	336	4,330	40	32-71
Swan River near Bigfork	1,166	8,890	193	32-73
Flathead River near Polson	11,740	82,800	7 2/	32-73

1/ Minimum recorded during closure of Hungry Horse Dam

2/ Minimum recorded during closure of Kerr Dam

Bigfork Dam has little effect on discharge or water temperature in the Swan River. Most of the flow in the lower mile of the river is diverted through the turbines in low flow periods, but water temperature is essentially unchanged because of the small reservoir storage capacity. Swan Lake has a warming effect on the river downstream. Maximum recorded water temperature for the Swan River downstream and upstream from the lake is 73 and 67° F, respectively.

Flathead Lake is a large, comparatively shallow, oligotrophic lake. Maximum depth is 371 feet. At least two smaller lakes in the drainage are deeper (Potter 1978). Surface temperatures commonly exceed 68° F in summer. Ice cover is common in bays but the entire lake is ice covered only once in ten years, on the average (D.A. Hanzel, Montana Department of Fish, Wildlife and Parks, Kalispell, Montana, personal communication). Water level of Flathead Lake fluctuates 10 feet annually as a result of Kerr Dam operations. Minimum levels normally occur in April while maximum level is maintained from July through September.

Operation of Kerr Dam can result in daily water level fluctuations of six feet in the lower Flathead River. Temperature of the lower Flathead is unaffected by Kerr operations; however, Flathead Lake has a natural warming effect on the lower Flathead River. Maximum water temperature in 1979 upstream and downstream from Flathead Lake was 67 and 73° F, respectively.

The lower Flathead River originates at the Southern tip of Flathead Lake at Polson, Montana, and flows south and west approximately 72.4 miles to its confluence with the Clark Fork River near Paradise, Montana. Approximately 68.6 miles of the river are within the exterior boundary of the Flathead Indian Reservation. Kerr Dam, the only existing impoundment in the lower Flathead River, is a hydroelectric facility located 4.3 miles downstream from Polson, Montana. The dam divides the Flathead River into upper and lower sections. The lower Flathead River drainage encompasses an area of about 2,400 square miles. The first four miles of the river below Kerr Dam are characterized by a fairly steep gradient of about 16 feet per mile. The next 40 miles downstream have a gradient of only 3.4 feet per mile with riffle and pool areas blended together in a comparatively smooth flowing river. The remaining stretch of river has even less gradient (1.5 feet per mile) with a few riffles.

The river between Kerr Dam and Buffalo Rapids has an average width of 375 feet and flows in a single channel through a narrow canyon. Deep pools and several sets of rapids are present. This section of river is subject to severe water level fluctuations as a result of hydropower peaking operations at Kerr Dam. Water levels at the U.S. Geological Survey gauging station downstream from Kerr Dam often fluctuate from two to eight feet in a very short period of time.

From Buffalo Rapids downstream to a point approximately 6.3 miles above Dixon, the river remains in a single channel with only a few small islands present. This stretch of river averages 420 feet in width. The banks are generally steep with benchlands beyond. High clay cliffs are common in this stretch. Water level fluctuations are less than upstream but they may vary as much as one foot in six hours at the bridge near Dixon, Montana.

From 6.3 miles above Dixon to the reservation boundary the river no longer maintains its single channel appearance, but is broken up by many islands. Numerous sloughs and backwaters are also found in this section. The average width for this section of river is 223 yards. The water is slow moving. The immediate shoreline tends to be steep as do the hills and benchland beyond.

Because of the discharges through Kerr Dam, water fluctuations downstream are often extreme and sudden. The water level may rise or drop two feet in one or two hours. Such fluctuations occur two or more times a day. During the low water months, a considerable amount of river bottom is exposed and reflooded with each of these extreme fluctuations.

Recreation Use

Outdoor recreational opportunities in the Flathead drainage are diverse. Fishing, hunting, hiking, river floating, sailing and water skiing are widely practiced. Extensive river floating by private parties and commercial outfitters occur on all river segments classified under the Wild and Scenic River Act (McLaughlin et al. 1981). Hiking and camping occur throughout the upper drainage, but especially in Glacier National Park, the Bob Marshall and Great Bear Wilderness areas, Mission Mountain primitive area and Jewel Basin. Glacier Park alone attracts well over one million visitors per year.

Fishing is probably the most popular outdoor activity in the upper drainage. Hanzel (1977) estimated 230,976 hours of fishing pressure were expended in the drainage above Flathead Lake in 1975. Fishing pressure on Flathead Lake averaged 123,000 angler-days per year between 1962 and 1964 (Robbins 1966). Fishing pressure is probably higher now. A comprehensive creel census, recreation and economic study of Flathead Lake and a portion of the upper drainage is in progress. The economic value of fishing in the upper Flathead drainage is estimated to be between $2.5 million and $10.5 million annually (Graham et al. 1980a).

Fish and Wildlife Resources

Although several exotic fish species have been introduced in the Flathead drainage, the three forks of the Flathead River still support excellent native fish populations. Westslope cutthroat trout, bull trout and mountain whitefish comprise the overwhelming majority of game fish present in the upper drainage (Montana Department of Fish and Game 1979; Graham et al. 1980c; Fraley et al. 1981). Resident and migratory populations of all three species are found in the drainage.

Cutthroat trout and bull trout are seasonally abundant in the upper Flathead River. Mountain whitefish is the most abundant resident fish species in the upper Flathead, but the river also serves as an important migration corridor for adult and juvenile cutthroat and bull trout (Huston and Schumacher 1978). Kokanee utilize the main stem and portions of the upper drainage for spawning (Graham et al. 1980a). A small, but possibly expanding, population of resident rainbow trout is also present (McMullin and Graham 1981).

Kokanee, bull trout, lake trout and cutthroat trout are the most sought after gamefish in Flathead Lake. Many other species are present.

Whitefish is the most abundant game species in the lower Flathead River. The fish population in this reach of river is dominated by squawfish and largescale suckers. Northern pike and largemouth bass are present in the lower section of this reach. Tributaries to the lower Flathead provide a fishery for westslope cutthroat trout, whitefish, rainbow trout and brook trout. The Jocko River is perhaps the most important tributary in this reach (Peterson 1979, Domrose 1970). A complete list of fish species and their relative abundance is given in Table 2.

The basin is widely known for its big game hunting. Elk, mule deek, whitetail deer, moose, mountain goat, bighorn sheep, black bear, grizzly bear, and mountain lion are big game species currently hunted in the basin. Numerous species of upland game birds are also hunted. Most important among these are blue, ruffed, and spruce grouse; hungarian partridge, and pheasant. Several species of mammals classified as furbearing and/or predatory animals are hunted and/or trapped for their pelts. Notable among these are mink, muskrat, marten, beaver, otter, wolverine, bobcat, lynx, coyote, and weasel. Many species of waterfowl inhabit the basin or stop here during migration and provide substantial hunting recreation. In addition, a large number of nongame animals inhabit the basin, including some classified as rare or endangered. The latter includes the northern rocky mountain wolf, bald eagle, and peregrine falcon.

Table 2. Distribution and relative abundance of fish species in the Flathead River drainage (U.S. Department of Interior, Fish and Wildlife Service 1979; Graham et al. 1980c).

Common name	Scientific name	Distribution[a]	Abundance[b]
Westslope cutthroat trout	*Salmo clarki lewisi*	4	A
Yellowstone cutthroat trout	*Salmo clarki bouvieri*	1	R
Rainbow trout	*Salmo gairdneri*	4	U
Brown trout	*Salmo trutta*	3	R
Bull trout	*Salvelinus confluentus*	4	A
Lake trout	*Salvelinus namaycush*	2	A
Brook trout	*Salvelinus fontinalis*	4	U
Kokanee	*Oncorhynchus nerka*	4	A
Coho salmon	*Oncorhynchus kisutch*	2	X
Mountain whitefish	*Prosopium williamsoni*	4	A
Lake whitefish	*Coregonus clupeaformis*	2	A
Pygmy whitefish	*Prosopium coulteri*	2	A
Arctic grayling	*Thymallus arcticus*	1	R
Northern pike	*Esox lucius*	4	U
Yellow perch	*Perca flavescens*	4	A
Largemouth bass	*Micropterus salmoides*	2,3	A
Smallmouth bass	*Micropterus dolomieui*	2	X
White crappie	*Pomoxis annularis*	2	X
Black bullhead	*Ictalurus melas*	2	U
Pumpkinseed	*Lepomis gibbosus*	2,3	U
Northern squawfish	*Ptychocheilus oregonensis*	4	A
Peamouth	*Mylocheilus caurinus*	4	A
Redside shiner	*Richardsonius balteatus*	4	A
Longnose dace	*Rhinichthys cataractae*	3	R
Longnose sucker	*Catostomus catostomus*	4	U
Coarsescale sucker	*Catostomus macrocheilus*	4	A
Slimy sculpin	*Cottus cognatus*	4	U
Mottled sculpin	*Cottus bairdi*	1	R

[a] 1 = above Flathead Lake, 2 = Flathead Lake, 3 = below Flathead Lake, 4 = entire drainage

[b] A = abundant, U = uncommon, R = rare, X = introduced but no longer present

HUNGRY HORSE AND HUNGRY HORSE REREGULATING PROJECTS

Project Description

Hungry Horse Dam is a high-head project located on the South Fork Flathead River, approximately 10 miles northeast of Kalispell, Montana. The Bureau of Reclamation began construction of the dam in 1948. Storage was begun in 1951, construction completed in 1953 and the reservoir filled in 1954. The dam is a concrete arch gravity structure, 564 feet high, with a crest length of 2,115 feet. Head at the powerhouse ranges from 398 feet to 488 feet within the range of normal operations. The powerhouse has a nameplate capacity of 285 MW but is operated at 328 MW.

The 35-mile long reservoir covers 23,750 acres. Maximum depth is 500 feet. Hungry Horse stores 3,468,000 acre-feet of water, of which 2,982,000 acre-feet is active storage. The storage ratio (active storage to average annual runoff) is large, 1.27 years. Thus, Hungry Horse can be operated in a cyclic manner, with drawdown to minimum pool lasting more than one season. In practice, however, it is operated to refill each year.

The Hungry Horse Reregulating Dam is proposed to accompany expansion of power capacity at Hungry Horse Dam. The 51-foot high proposed dam would impound 3.4 miles of the South Fork Flathead River. The reservoir would contain an estimated 1,950 acre-feet of storage. It is not known at this time if electrical energy would be produced at the reregulating dam. The dam would be operated to reduce water level fluctuations in the main stem Flathead River (U.S. Water and Power Resources Service, 1981). Potential water level fluctuations will increase if any of the Hungry Horse added power alternatives are realized. The alternatives are:

1. Existing condition (328 MW, hydraulic capacity = 11,420 cfs).
2. Uprate existing generators (385 MW, hydraulic capacity = 12,060 cfs).
3. Powerhouse addition (383 MW, hydraulic capacity = 13,370 cfs).
4. Uprate and powerhouse (440 MW, hydraulic capacity = 13,783 cfs).

Project Operation

Hungry Horse is one of four major storage projects in the Columbia River Basin, along with Libby, Dvorshak and Grand Coulee in the United States. Hungry Horse is unique in that it literally sits at the top of the system. Water released from Hungry Horse Reservoir passes through 20 power plants on its journey to the Pacific Ocean. Slightly less than one billion kilowatts of electrical energy are produced at Hungry Horse annually. The water released from Hungry Horse, however, produces another 4.6 billion kilowatts at downstream power plants. Simons and Roribaugh (1971) reported 1,700 kilowatts are produced with each acre-foot of Hungry Horse water, more than any other dam in the system. Because of its position, Hungry Horse is often the first project called upon to make up the difference when problems occur at another power plant. Hungry Horse operation is normally cyclic (up on weekdays, down on weekends), but when problems occur within the power grid, Hungry Horse may operate at full capacity 24 hours per day.

At the present time, there are no constraints on operation of Hungry Horse Dam related to fish and wildlife.

History of Fish and Wildlife Resources

Fisheries

Prior to impoundment by Hungry Horse Dam, the South Fork Flathead River supported spawning migrations of westslope cutthroat trout, bull trout and mountain whitefish from Flathead Lake and the Flathead River. Fluvial cutthroat (fish that resided in the South Fork and spawned in tributaries) as well as tributary resident cutthroat populations were also found.

Since impoundment, adfluvial (fish that reside in a lake or reservoir and spawn in tributaries) populations of cutthroat and bull trout have developed in Hungry Horse Reservoir. Fluvial and resident populations are still found in the drainage above the reservoir.

Wildlife

Very little data on pre-impoundment wildlife distribution or population levels have been recorded. Therefore, most of the impacts of the Hungry Horse Project are based on discussions with Montana Department of Fish, Wildlife and Parks biologists and their assessment of impacts that would occur if similar, adjacent areas were flooded.

Two early reports reflect the distribution and numbers of elk wintering in the area flooded by Hungry Horse Dam, and give an indication of the magnitude of the impacts this project had on this species. A March, 1951 aerial census counted 182 elk in about the lower two-thirds of the area that was later flooded (McDowell and Sylvester 1951). A subsequent report (Marshall 1954) reported that wintering elk in the South Fork of the Flathead were, for the most part, confined to river and creek bottoms and to south and west facing slopes. Wind-bared ridgetops were also used below Spotted Bear. Based on the area of occupied winter range and number of elk observed, Marshall (1954) calculated a winter density of 16.8 elk per square mile.

Impacts on Fish and Wildlife

Fisheries

Construction of Hungry Horse Dam cut off the South Fork to migratory fish in the rest of the Flathead drainage. All of the major game fish species in the drainage (westslope cutthroat trout, bull trout, kokanee and mountain whitefish) are migratory. Contribution from over 38 percent of the tributary drainage area above Flathead Lake was lost with construction of Hungry Horse, resulting in an estimated loss of as much as 60 percent of the spawning by cutthroat and bull trout to Flathead Lake (Graham 1980).

The environment of the main stem Flathead River below its confluence with the South Fork was also altered by Hungry Horse. Peak spring flows were lowered as South Fork run-off was held back to fill the reservoir. Summer, fall and winter flows began to fluctuate in response to South Fork flows. Hypolimnial release of water from Hungry Horse Dam altered temperatures in the South Fork and main stem. South Fork temperatures remain near 40° F year around. Summer temperatures in the main stem are cooled by South Fork inflow. When Hungry Horse powerhouse operates at peak capacity, water temperature in the main stem can be lowered as much as 15° F. In winter, South Fork inflow can warm the main stem as much as 8° F. Changes in temperature caused by operation of Hungry Horse Dam affect aquatic insect development and production, and fish growth. Significant changes in spawning behavior of kokanee, probably related to temperature, also occurred after impoundment of the South Fork.

Timing of the spawning migration of westslope cutthroat trout from Flathead Lake up the Flathead River may have been altered as a result of changes in flow and temperature resulting from discharge from Hungry Horse Dam (Huston and Schumacher 1978). It is hypothesized that flushes of warm water from Hungry Horse in fall and winter may act as a migration cue. Adult cutthroat begin moving up into the river as early as October, although spawning does not occur until the following May or June (McMullin and Graham 1981). It is not known why Flathead cutthroat begin their migration as early as they do, or if the early migration adversely affects reproduction. Timing of cutthroat spawning migrations prior to Hungry Horse Dam is not known.

Juvenile adfluvial cutthroat are also affected by Hungry Horse operations. Until recently, it was thought that juvenile cutthroat leaving North and Middle Fork tributaries in summer went directly to Flathead Lake. During 1980-81, many juvenile cutthroat over-wintered in the main stem Flathead River below its confluence with the South Fork (McMullin and Graham 1981). During winter, the partially regulated portion of the river offers warmer temperatures and probably more food than either the upper drainage or Flathead Lake. In the nearly 30 years since impoundment, cutthroat may have adapted to the use of the river as a wintering area. However, migratory behavior of juvenile cutthroat prior to Hungry Horse Dam is not documented.

Impacts of Hungry Horse Dam upon cutthroat trout in the Flathead system are complex. Juvenile and adult phases of cutthroat life history are affected, but at the present time, it is not known if flow and temperature fluctuations caused by Hungry Horse Dam are detrimental. Some impacts may be beneficial.

Bull trout life history is similar to that of cutthroat. Flow and temperature fluctuations undoubtedly affect bull trout in some manner, but there is not evidence to suggest that bull trout life history has changed as a result of Hungry Horse Dam. The major impact on bull trout of

Hungry Horse was the loss of spawning and rearing habitat. Habitat loss may have been greater for bull trout than cutthroat. Bull trout utilized the entire South Fork drainage while migratory cutthroat were probably limited to the area below Meadow Creek Gorge (Huston 1973a).

Kokanee are affected more directly by Hungry Horse operations than any other species in the drainage (McMullin 1980). Prior to construction of Hungry Horse Dam, most kokanee spawned along the shores of Flathead Lake, in the Whitefish River and McDonald Creek, streams that drain large lakes (Stefanich 1952; 1953a; 1954). Few, if any, kokanee spawned in the main stem Flathead River. After Hungry Horse Dam began operations, a shift from lakeshore spawning to river spawning was noticed (Hanzel 1964). It was hypothesized that water temperatures during the spawning and early incubation stages were too cold in the Flathead River prior to Hungry Horse Dam to allow adequate survival. The warming effect of Hungry Horse water releases encouraged kokanee egg survival. Favorable discharge regimes in the early years of Hungry Horse operation resulted in increased river production of kokanee. At the same time, lakeshore spawning was decreasing (Graham et al. 1980a).

Throughout the early 1960's, flows in the Flathead River during the kokanee spawning and incubation period were nearly ideal for egg survival. Flows during the incubation period (December-March) were nearly always as high or higher than flows during the spawning period (November). Production from river spawning areas more than made up for the lack of lakeshore spawning and by the late 1960's, the total population of kokanee was probably at a maximum. No population data are available, but average length of kokanee spawners was the smallest recorded from 1966 through 1968. Density-dependent growth of kokanee is well documented in scientific literature (Foerster 1944, Bjornn 1957, Johnson 1965, Goodlad et al. 1974, Stober et al. 1978).

Hungry Horse operations changed dramatically beginning in water year 1967. Flows during the spawning period were generally high. Incubation period flows were generally lower, resulting in dewatering of eggs deposited in the river gravels. Mortality of eggs due to freezing and desiccation occurred. The kokanee population declined from maximum levels of the 1960's and average size increased. By the late 1970's, Hungry Horse operations resulted in worst case conditions for kokanee egg survival. In 1980, very few kokanee redds were found in the Flathead River and the average length of spawners was the largest observed during the period of record in the Flathead drainage (McMullin and Graham 1981).

The problem with Hungry Horse operations during recent years is that drafting of the reservoir for power and flood control begins in early fall. Consequently, flows during the kokanee spawning season are nearly always high. Through the winter, Hungry Horse discharges are determined by snow pack and run-off forecasts. Some dewatering of eggs invariably occurs and often periods of dewatering are extended (Graham et al. 1980b). Critical periods usually occur in January and February when forecasts are less reliable, weather is severe and eggs can tolerate very little dewatering (McMullin and Graham 1981).

The proposed Hungry Horse Reregulating Dam would flood most of the remaining South Fork Flathead River below Hungry Horse Dam. The lower South Fork fishery is of little value except for a small run of kokanee. Present studies suggest a reregulating dam would benefit main stem Flathead River fish populations by reducing the magnitude and timing of water level fluctuations (Graham et al. 1980b, McMullin and Graham 1981). The exact storage capacity of the reregulating dam must be determined before evaluation can be completed.

The most important problems facing the fish population of Hungry Horse Reservoir are barriers to migration of spawning cutthroat and bull trout at road crossings of tributary streams and the timing and extent of reservoir drawdown. When Hungry Horse Dam was constructed, perimeter roads were built on both sides of the reservoir. Where the roads intersected tributary streams, most streams were routed through culverts. Most of the culverts were poorly installed and resulted in barriers to cutthroat and bull trout spawners (Gaffney 1959a; Huston 1964).

Drawdowns exceeding 85 feet in Hungry Horse Reservoir appear to reduce survival of cutthroat trout (Huston 1969a). Drafting of the reservoir during the recreation season limits boat access (Huston 1975a). Limited access is partially made up by improved fishing success, probably due to crowding of fish into a smaller area (Huston 1971a).

Wildlife

In excess of 25,400 acres (approximately 39.75 square miles) were cleared of all timber, brush and snags from the reservoir area prior to flooding (U.S. Department of Interior, Bureau of Reclamation 1958). From this it can be seen that local wildlife populations were severely impacted. This impact was almost entirely negative, the degree varying with the species involved.

Severe losses of yearlong habitat were suffered by species such as white-tailed deer, black bear, mountain grouse, beaver, muskrat, mink, otter and a wide variety of nongame wildlife. Significant losses of spring through fall grizzly bear range also occurred. Moderate losses of yearlong habitat were sustained by bobcats and most other furbearers not mentioned above. Losses of winter elk range were described as moderate, being lessened by the fact that only part of the winter range occurred in stream bottom habitats. Similarly, declines in mountain lion numbers were rated as moderate, primarily occurring in winter and spring and being the result of a declining prey base, primarily white-tailed deer.

Migrating waterfowl, especially fall migrants, received a moderate positive influence through the provision of resting areas. Waterfowl nesting probably declined slightly following impoundment, possibly being a major impact on harlequin ducks which occupy this area, but whose breeding densities are not great anywhere.

The Hungry Horse reregulating dam and reservoir both would be small, with the reservoir projected to have a surface area of 88 acres. Yearlong resident wildlife found in the area that would be flooded include white-tailed deer, ruffed grouse, otter, beaver, mink, muskrat. raccoon, some waterfowl species and a wide variety of nongame birds and mammals. Seasonal residents and/or migrants that would be affected include mule deer, elk, black bear, bald eagles, some waterfowl species and many nongame animals as well.

A big game migration route reportedly crosses the South Fork of the Flathead just below Hungry Horse Dam (U.S. Water and Power Resources Service 1981). A few mule deer and white-tailed deer winter in the area of the planned impoundment northwest of Whelp Creek and southerly along the west facing aspect. The U.S. Water and Power Resources Service (1981) also reports that although bald eagles winter in the area, there is no evidence of eagle nesting along the South Fork in the immediate vicinity of the proposed project. However, Flath (Montana Department Fish, Wildlife and Parks, Bozeman, Montana, unpublished data) notes several active bald eagle nests within a 20-30 mile radius of the proposed reregulating dam, including one along Hungry Horse Reservoir 10-12 miles upstream from the dam. This nest was active and fledged two young in both 1980 and 1981. This suggests that the bald eagle may have been dismissed too hastily and that more consideration may need to be given to it in planning for this project. Additional study would probably be required to determine their status in the general vicinity of the proposed project.

The U.S. Water and Power Resources Service (1981) further suggests that modification of flows by the reregulating dam and reservoir would slightly improve the stability of ecological systems downstream, resulting in small increases in suitable wildlife habitat and riverine wildlife populations, especially for beaver and muskrat. Although water level fluctations would be generally reduced from present conditions, their report further shows that with this project, fluctuations at Columbia Falls will average 1.0 to 1.4 feet during October and January, respectively, with maximums of 4.0 and 4.9 feet for the same months (U.S. Water and Power Resources Service 1981). The latter figure is the same as the current January maximum, and it is not likely that beaver and muskrats will be able to successfully cope with even the average water level fluctuations given.

Though the impacts of this project on wildlife would be almost entirely detrimental, they would be of limited magnitude simply because of the relatively small size of the planned impoundment. These impacts would have to be balanced with the potential positive impacts on the fishery.

Mitigation of Project Impacts

No mitigation measures were specified during the construction of Hungry Horse Dam.

Cooperative programs between the Bureau of Reclamation, U.S.D.A. Forest Service and Montana Department of Fish and Game alleviated fish passage problems in many creeks (Huston 1964; 1970a; 1975a). Fish passage problems regularly reoccur, however, as stream hydraulics change and culverts again become impassable. A major flood could make many streams impassable again (Joe Huston, Montana Department of Fish, Wildlife and Parks, Kalispell, Mt. personal communication).

Since 1976, the Bureau of Reclamation has funded studies by the Montana Department of Fish, Wildlife and Parks to determine impacts of Hungry Horse operations on fish and insect populations in the Flathead River. Studies since 1979 have been part of Appraisal and Feasibility studies for increased power production at Hungry Horse Dam and a proposed reregulation dam downstream.

Construction of the Hungry Horse project was completed with no mitigation for losses of wildlife values being carried out. In addition to losses directly attributed to flooding, building of roads down each side of the reservoir area in order to clear the area to be flooded provided access that hastened the logging of much of the drainage area of the South Fork of the Flathead. This has had further negative impacts on many wildlife species.

Management Goals and Objectives

Fisheries

The fish program goal is to perpetuate aquatic species and their ecosystems and meet the public demand for fish in state waters. To meet this goal, aquatic communities and their habitat must be preserved, protected and enhanced where feasible. Management is designed to equitably distribute angling opportunity.

Quality habitat is the key to fish populations. Preservation and protection of present habitat and restoration of degraded habitat (where feasible) is a very high priority. Fish habitat and populations should be managed on a drainage wide basis. For example, small tributaries used for spawning, larger streams used as fish passageways and large rivers used for rearing are interrelated and must all be preserved to maintain migratory populations of fish that are common in Montana. Important components of fish habitat which must be maintained include water quality, water quantity, physical integrity of stream channels and lakeshores, stream and lakeside vegetation, and adequate passage for migratory fish.

Bull trout, westslope cutthroat throut and kokanee are the major game species in the Flathead drainage. All three species are migratory and consequently, the entire upper drainage must be treated as a unit. Trout and salmon reside in Flathead Lake, but use tributary streams as nursery and/or spawning areas. Because major game species utilize the entire river-lake system, an ecosystem approach to management is necessary.

All fish species in the upper Flathead drainage are affected by operation of Hungry Horse Dam and Kerr Dam, but kokanee are affected most directly. Just as Hungry Horse and Kerr Dams are operated in concert with the other components of the Northwest power grid, their operation has a combined effect on fish populations.

Hydro-related management objectives in the Flathead drainage are:

1. To document the effects of Hungry Horse and Kerr Dam's operations on spawning, incubation mortality and growth of kokanee; and

2. To develop recommendations leading to a balanced operation of Hungry Horse and Kerr Dams that will optimize kokanee production and recreational opportunity in the Flathead system.

Optimum production and recreational opportunity is defined as an angler harvest balanced between total catch and size of fish. Graham et al. (1980a) estimates an annual catch of 500,000 to 600,000 kokanee with an average total length of 12 to 13 inches would meet the objective. Population size and length of kokanee are closely linked by a complex density-dependent relationship (Johnson 1965; Rieman 1979).

Wildlife

To protect, maintain and enhance the available supply of all species of wildlife and their habitat in the project area in order to meet the demand for all types of wildlife-oriented recreational pursuits.

Recommendations to Protect, Mitigate and Enhance Fish and Wildlife Resources

Fisheries

1. Hungry Horse Dam should be operated to insure successful reproduction of kokanee in the Flathead River as follows (1.1.1):

Spawning: Flow at Columbia Falls should be not less than 4,000 cfs and not more than 4,500 cfs between the hours 1700 and 2400 throughout the spawning season (October-November). From 2400 to 1700 hours, the flow may exceed 4,500 cfs but should never be less than 2,500 cfs.

Incubation: A minimum flow of at least 2,500 cfs at Columbia Falls should be maintained 24 hours per day from December 1 through March 31.

Emergence: A minimum flow of not less than 4,000 cfs at Columbia Falls should be maintained 24 hours per day from April 1 until combined flows of the North and Middle Fork Flathead River exceed 4,000 cfs.

The Flathead Basin kokanee population can be maintained at desirable levels (Graham et al. 1980a) with natural reproduction only if flows during the spawning, incubation and emergence periods are favorable. Excessive mortality of eggs and alevins occurs when flows are high during the spawning period and low during the incubation and/or emergence periods. The recommended spawning flow should provide adequate spawning habitat while preventing kokanee in the Flathead River from spawning in areas subject to severe dewatering. Recommended minimum incubation flows should prevent dewatering of most redds, although some egg mortality due to dewatering could occur. Egg survival should be maintained at levels consistent with Montana management objectives (Graham et al. 1980a). Minimum flows during the emergence periods must be at least as high as spawning flows to insure that fry can successfully emerge from the gravel and migrate downstream. Studies are underway to evaluate what would be the most cost-effective way to provide these flows. Recommendations from these studies should be supported by the Council.

2. *A minimum flow of at least 2,500 cfs in the Flathead River at Columbia Falls should be maintained 24 hours per day from July 1 through October 31 (1.1.2).*

The recommended minimum flow, together with flows recommended for kokanee spawning, incubation and emergence, would essentially establish a year around minimum flow of 2,500 cfs at Columbia Falls. A flow of 2,500 cfs corresponds to the inflection point on the curve of wetted perimeter (the cross-sectional area of stream bottom in contact with water) versus discharge for a transect in the Flathead River near Kalispell, Montana (Figure 2). The curve was generated by the WETP computer program (Nelson 1980a) from data collected in 1980 by the Montana Department of Fish, Wildlife and Parks. The wetted perimeter method of determining instream flow recommendations proved to be the most effective of four methods tested on southwest Montana streams (Nelson 1980b).

Combined fiftieth percentile flows of the North and Middle Fork Flathead Rivers exceed the recommended minimum in July and August (Table 3). During September and October, under median flow conditions, discharge in excess of the present operational minimum (145 cfs) at Hungry Horse Dam would be needed to maintain 2,500 cfs at Columbia Falls. In order to meet the recommended minimum flow at Columbia Falls, flows in excess of the present operational minimum at Hungry Horse Dam would be needed in mid-July under extreme low flow conditions, mid-August under eightieth percentile flow conditions and late August under median flow conditions.

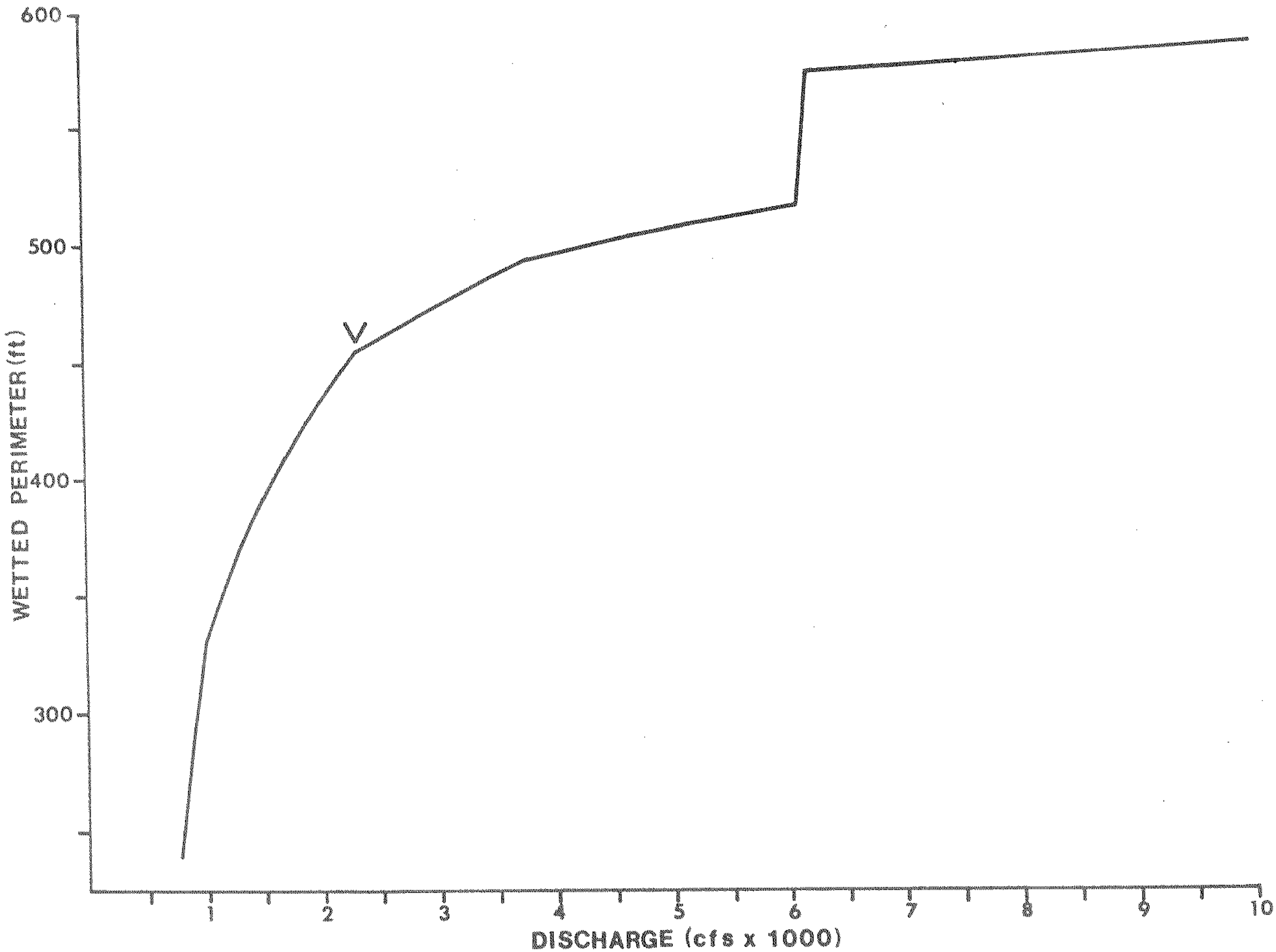

Figure 2. Wetted perimeter and discharge relationship for a cross section of the Flathead River downstream from the South Fork.

Table 3. Fiftieth and eightieth percentile combined North and Middle Fork flows and probability that combined North and Middle Fork flows plus present Hungry Horse operational minimum flow would exceed 2,500 cfs. Based on data provided by Bureau of Reclamation, Boise District office, water years 1929-80.

Month	50th Percentile (cfs)	80th Percentile (cfs)	Probability that flow exceeds 2,500 cfs
July	7,619	4,912	1.00
August	2,909	2,182	0.68
September	1,885	1,554	0.24
October	1,646	1,364	0.34

If the Flathead River was not partially regulated by Hungry Horse Dam, mean monthly flow at Columbia Falls would exceed 2,500 cfs year around (Montana Department of Fish, Wildlife and Parks, unpublished data on file, Kalispell, MT). Table 4 lists mean monthly flows at Columbia Falls for a theoretically unregulated Flathead River.

3. *Effects of amount and timing of controlled discharges from Hungry Horse Dam on distribution and migration of kokanee spawners in the Flathead River should be quantified (1.1.3).*

Effects of Hungry Horse discharge on kokanee reproductive success under unfavorable flow conditions have been documented (Graham et al. 1980b). Reproductive success under a controlled flow regime could not be documented due to a poor run of kokanee into the Flathead River in 1980 (McMullin and Graham 1981). The controlled flow regime listed in recommendation one represents an estimate of desirable flow conditions for kokanee spawning, incubation and emergence. Spawning site selection is defined by a narrow range of parameters that change with flows. Availability of fish to anglers, as well as reproductive success, could be affected by the recommended flows and should be documented.

A study is under way inpart to further investigate the impact of discharge from Hungry Horse Dam on availability of kokanee on their spawning migration to fishermen in the Flathead River.

4. *Construction of a kokanee spawning channel in the South Fork Flathead River should be considered (1.8.1).*

A spawning channel could mitigate for the loss of South Fork spawning if Hungry Horse Reregulating Dam is built. A spawning channel would not serve as a substitute for good spawning, incubation and emergency flows in the Flathead River. Controlled flows are designed to restore and maintain a river fishery for spawning kokanee, not simply more fish. Attracting large numbers of kokanee to a spawning channel would contribute to the Flathead Lake fishery but may have only a limited effect on the river fishery.

It is probable that flow conditions requested in recommendation one could not be met every year. Assuming they are met 8 out of 10 years, the spawning channel would insure that some reproduction occurred every year and help stabilize the river and lake fishery.

At this time it is not expected that the channel would be very large. Its purpose would be to supplement not replace main-river spawning. In addition, it would not be desirable to produce too many salmon because a large decrease in average size of spawners would not be acceptable to the fishermen.

5. *Critical habitat areas in North and Middle Fork Flathead River tributaries should be protected from any development that could not guarantee the project would not adversely affect gamefish rearing habitat (1.9.1).*

Table 4. Theoretical mean monthly flows of the Flathead River at Columbia Falls, assuming the South Fork was not impounded by Hungry Horse Dam. Based on data provided by Bureau of Reclamation, Boise District office, water years 1929-80.

Month	Mean Flow (cfs)
October	3,422
November	3,496
December	3,071
January	2,531
February	2,529
March	2,841
April	11,511
May	33,882
June	33,893
July	12,016
August	4,153
September	2,985

The free flowing portions of the upper Flathead basin are essential components of the basin's ecosystem. The North and Middle Forks and their tributaries provide excellent wild trout fisheries (some critical spawning tributaries are closed to fishing). Of equal importance is the production of gamefish in the upper drainage, upon which the trout fishery of the lower drainage is dependent. Reduced production in the upper drainage would adversely affect the fishery of the entire basin. Montana Department of Fish, Wildlife and Parks is in the process of developing specific instream flow recommendations for the North and Middle Forks. No data has been collected to date for the purpose of establishing instream flows on tributaries of the North and Middle Forks.

Many tributaries of the North and Middle Forks are located in Glacier National Park or wilderness areas. These streams are protected from developments that would degrade habitat. It is unlikely that any dams will be built on these streams. However, much of the critical trout habitat in the upper Flathead drainage is located in unprotected streams, particularly in the North Fork drainage. Because of the migratory nature of the basin's major sport fish, North and Middle Fork tributaries are critical to the entire basin. The importance of North and Middle Fork tributaries to the ecosystem has been magnified since impoundment of the South Fork. Any development, hydroelectric or otherwise, that would restrict migration to or quality of critical habitat areas could have severe impacts on the fisheries of the entire basin. North Fork tributary drainages that merit especially vigorous protection include, but are not limited to, Big Creek, Coal Creek, Red Meadow Creek, Whale Creek and Trail Creek.

6. *Drawdown of Hungry Horse Reservoir should not exceed 85 feet (1.2.1).*

In-reservoir survival of westslope cutthroat trout appears to be reduced by drawdowns exceeding 85 feet. Poor survival of cutthroat results in reduced angling opportunity in the reservoir. Reservoir drawdown of over 85 feet may be necessary to meet the requested instream flows for the Flathead River. If so, the tradeoffs must be evaluated.

Wildlife

A study should be initiated to assess potential areas where management of wildlife could be considered as mitigation of habitat lost by construction of Hungry Horse Dam and make appropriate recommendations.

Areas flooded are, for all practical purposes, lost forever. Protection of wildlife values is no longer a viable option and there is really no way that operational changes in the project could benefit wildlife in any but the slightest degree. Relatively large-scale expenditures for enhancement of adjacent areas or completely off-site mitigation would be necessary to even partially offset losses already incurred.

The problem statement has illustrated the difficulty in, and lack of mitigation for, losses of wildlife habitat associated with past hydroelectric development. A major difference between the fishery and wildlife impacts is that although hydroelectric development may change the species composition, productivity, access, or other features of the fishery, some form of a fishery generally remains. Mitigation measures associated with passage, reservoir operation, artificial enhancement, etc. can often offset some of the fishery losses. For wildlife, there is usually a complete loss of habitat resulting from inundation, rip-rap, roading, etc. On-site mitigation is difficult and generally results in purchasing land which is already productive habitat. Without intensive management, this results in a net loss for wildlife, and usually a loss of land in private ownership.

For replacement of lost wildlife values to be realized through habitat improvement, either on-site or off-site, a larger acreage of land will usually be required than that actually flooded, even if intensively managed. This is due to two factors. First, the riparian habitat lost is generally more productive than replacement lands, and second, in most cases the lands to be managed are already occupied and superimposing new populations on those present will require more than a simple acre-for-acre replacement, plus intensive management.

On-Site

Habitat manipulation on project lands to improve food and/or cover for various species of wildlife could help offset some of the wildlife values lost through construction of this project. Species to be managed for and appropriate techniques would have to be determined prior to initiating such practices.

Creation of permanent, relatively shallow water ponds, through construction of dikes to retain water during drawdowns or by trapping water from small streams or springs could benefit many species. Islands that would be above the high water level could be constructed at the same time as dikes, and would provide nesting waterfowl with additional nest sites. Stablization of water levels behind such dikes would allow submerged and emergent aquatic vegetation to establish themselves, along with cottonwoods, willows, etc. along shorelines. This would benefit many species, especially aquatic furbearers and nongame in addition to waterfowl. If deep enough to support fish year-round, such areas might also provide additional and/or better foraging areas for osprey and bald eagles nesting in the vicinity.

Opportunities for on-site improvement of wildlife values on existing projects are limited to project waters and generally narrow land boundaries. As an alternative to on-site activities and/or to further improve the wildlife values in the project vicinity, off-site enhancement of a designated species, or group of species, as compensation for previously unmitigated wildlife losses may be necessary.

Off-site

Loss of wildlife values due to existing hydroelectric developments should be mitigated by acquiring management rights to an agreed quantity of land.

This could be either private, public or a combination of the two. Securing such rights to government owned lands might meet with less public opposition, which often arises when private lands are purchased and removed from local tax rolls. This land would be managed for wildlife benefits, with all other management decisions secondary. This would not require ownership of the land rather a set of requirements that existing or future landowners would relinquish to the fish and wildlife agency. These may include surface easements, mineral rights, water rights, etc. Management rights to these lands should be guaranteed and acquisition begun immediatelv to reduce the impact of ever escalating costs.

This would not preclude development of the land for timber, agriculture, grazing, or other uses, if conducted in a manner and to the extent that they are compatible with wildlife management objectives. This would leave land in its existing ownership while providing an opportunity to enhance its potential for wildlife production, thereby providing a new gain for wildlife with a minimum of inconvenience to the owner.

Such management rights should be secured for both riparian zones and upland areas impounded. In many areas, the potential for rehabilitating and protecting riparian vegetation is large. The concept is to manage these zones to provide optimum wildlife habitat through selective cutting, fencing, revegetation, increase minimum stream flows, and other techniques. This would not require purchasing the land, but existing scenic easements are not the answer. Management of these zones is necessary to insure that their potential as critical wildlife habitat is sustained over time. Acquiring management rights could result in a range of management decisions from "hands-off" to rehabilitation of severely damaged habitat. Rehabilitating potentially good habitat would have the largest short-term gains. Mitigation measures should also provide the funds necessary to implement management recommendations, and provide for ongoing development and operations.

During the planning for any mitigation program, it is necessary to identify the target species the area will be managed for. Regardless of the species managed for, or the methods employed, most habitat management programs for wildlife mitigation purposes should strive for a complex mosaic of many habitats and age classes to result in the greatest benefit for all wildlife. Continued management costs and efforts will usually be necessary to maintain realized benefits of mitigation. The frequency and extent of these costs should be estimated and included in project funding for the expected life of the mitigation project, and extended if necessary.

BIG FORK PROJECT

Project Description

The Big Fork hydroelectric project is located on the Swan River adjacent to the town of Big Fork, Flathead County, Montana. The project was constructed in 1902 by the Big Fork Electric Company with an installed capacity of 360 kilowatts. The project was gradually expanded and sold in 1909 to Northern Idaho and the Montain States Power Company, which merged with the present owner, Pacific Power & Light Company in 1954. The present installed capacity of 4,150 kilowatts was attained in 1928 (Federal Power Commission 1976).

The project includes: a 300-foot long, 12-foot high concrete diversion dam with a 15 pool fish ladder; a 1.5 mile-long reservoir with storage of 109 acre-feet, surface area of 71 acres, and maximum depth at full pool of 18 feet; an intake structure which diverts water into a one mile-long conduit; a powerhouse situated at the downstream end of the conduit, with two 1700 kilowatt generators and one 750 kilowatt generator. The dam is located 1.5 miles upstream from the mouth of Swan River which empties into Flathead Lake. The maximum capacity in the conduit is 500 cfs which conveys water around a one mile reach of stream. Since stream discharge can be below 500 cfs from August through March, the project has the potential to divert the entire stream flow during most years (Federal Power Commission 1976, Pacific Power & Light Company 1977).

Project Operation

The Big Fork Project is operated as a baseload diversion project. The maximum diversion rate is 500 cfs; flows greater than this spill over the concrete dam. Annual flow averages 1,144 cfs. Flow during April through July is normally greater than 500 cfs, while flow can drop below this level the remainder of the year.

Prior to 1976, Pacific Power & Light Company voluntarily released a minimum flow of 25 cfs at a time when spilling ceased. This was provided by the fish ladder and stop-log section in the dam. Beginning in 1977, releases for a minimum flow were increased to 40 cfs (Pacific Power & Light Company 1977).

Beginning in 1963, at the request of Montana Department of Fish and Game, Pacific Power & Light Company released slugs of water (150-250 cfs) from the dam from about 2:00 a.m. to 6:00 a.m. on two or three days a week during the upstream migration of kokanee. Concurrently, plant loading was reduced. The releases of three to four hours duration were made to attract the kokanee from the powerplant tailrace to the one mile section of river below the dam. This proved to be successful in stimulating fish movement past the tailrace and has been continued in subsequent years when needed (Pacific Power & Light Company 1977).

Article 24 in the license issued by the Federal Power Commission (1976) for the Big Fork Project required the operator to "....release adequate flows of water from the diversion dam or through the fish ladder to maintain fish migration and fish habitat." Operational procedures have been adopted by Pacific Power & Light Company to meet the requirements of Article 24 using the best available information.

History of Fish and Wildlife Resources

Bull trout, an important native species, live in Flathead Lake as adults or subadults and migrate into tributaries to spawn (Graham et al. 1980c). The migratory pattern of this species is similar in both the North and Middle Forks of the Flathead River which are the last major tributaries not impounded by dams. Bull trout are found migrating up the lower Swan River (in small numbers) and found throughout the upper Swan drainage (Domrose 1974). Bull trout residing in Flathead Lake probably used the Swan drainage extensively prior to construction of Big Fork Dam in 1902 (Gaufin et al. 1976).

Westslope cutthroat trout, another important native species, also migrate out of Flathead Lake for the purpose of spawning (Graham et al. 1980c). Cutthroat trout migrate up the lower Swan in small numbers (Domrose 1974). Historically, cutthroat trout probably used the Swan drainage extensively for spawning prior to construction of Big Fork Dam (Gaufin et al. 1976).

The first sport fishery for kokanee salmon, an introduced species, was noted in 1933 (Gaufin et al. 1976). Since that time, a significant kokanee spawning run and snag fishery has developed downstream from Big Fork Dam.

A resident rainbow trout fishery exists both upstream from Big Fork Dam (below Swan Lake) and in the one mile reach downstream from the dam. This is one of the few areas in northwestern Montana where a stream fishery exists for this species.

Impacts on Fish and Wildlife

Fisheries

Big Fork Dam is a barrier to bull and cutthroat trout which historically migrated out of Flathead Lake into the Swan River drainage (Gaufin et al. 1976) because of the ineffective fish ladder.

This project has cut off 16 miles of river access from Flathead Lake to Swan Lake and another 59 miles above Swan Lake plus access to numerous tributaries (Domrose 1974). Access is blocked to migrating kokanee salmon, which were not present when the project was built, to potential spawning areas upstream.

The Big Fork Project reduces flows in the one mile reach of river between the dam and powerhouse. The effect of the reduced flows on fish rearing, migration, reproduction, and survival for both resident and migratory fish has not been adequately determined. Species most likely impacted include rainbow trout and kokanee salmon.

Big Fork Dam and Reservoir have prevented new recruitment of small rubble and gravels to the reach of river between the dam and powerhouse. Repeated flood stage flushing has removed all but a few dozen square feet of spawning gravel. The declining kokanee spawning in this area in recent years may be tied to reduced amounts of spawning size gravel (Montana Department of Fish and Game 1977). Other species of fish which may potentially spawn in this reach, particularly rainbow trout, may also be impacted.

Since Big Fork Dam has potential to divert all or most of the Swan River through the powerhouse during periods of low flow, young fish or fish larvae drifting downstream may become entrained or entrapped in the diversion or generators. Older fish migrating downstream may likewise be impacted.

Wildlife

The project flooded an area of 71 surface acres which undoubtedly served as year-long and/or winter range for white-tailed deer, ruffed grouse, furbearers, and a wide variety of nongame wildlife. Additional species such as mule deer, black bear, waterfowl, etc. probably utilized the area on a seasonal or more sporadic basis. Although the impacts of this project on wildlife were almost entirely negative, they were of relatively small magnitude since the amount of habitat lost was relatively small.

Mitigation of Project Impacts

Fish passage facilities were built into the project but were not effective. In 1960, modifications were made in the facilities (increased the number of pools, changed position of the entrance), but again the structure passed only very few game fish (Domrose 1974). To date, significant upstream migration of fish over Big Fork Dam has not occurred.

Prior to 1973, Pacific Power & Light Company released 25 cfs as a minimum instream flow (over Big Fork Dam or through the fish ladder) during periods when flow could be entirely diverted through the powerhouse. In 1977, minimum flows were increased to 40 cfs (Pacific Power & Light Company 1977). Minimum flows normally can occur from September through March. The adequacy of this instream flow has not been quantified for rearing of rainbow trout or for reproduction of kokanee salmon. During years of low flow, discharge from the powerhouse may be much greater than that flowing over the dam into the natural channel. When this occurs during migration periods, kokanee congregate in the tailrace of the powerhouse. To stimulate kokanee migration upstream to Big Fork Dam, for the purpose of spawning and to provide a snag fishery, Pacific Power & Light Company in 1963 began releasing water (between 150-250 cfs) from the dam from about 2:00 a.m. to 6:00 a.m. on two or three days a week. Concurrently, loading was reduced. This proved to be successful to induce kokanee migration to the dam and has been continued in subsequent years as needed (Pacific Power & Light Company 1977). The effect of the present flow regimen on spawning success of kokanee has not been determined.

In 1978, 100 yards of clean gravel were placed downstream from Big Fork Dam to enhance kokanee reproduction. Another 300 yards of less than one-half to four-inch-sized gravel was added in 1981. The effectiveness of this measure to enhance kokanee reproduction is yet to be evaluated.

The intake structure is not screened to prevent entrapment or impingement of fish, nor has the need for one been evaluated.

Management Goals and Objectives

Fisheries

The fish management goals for the lower Swan River include:

1. Improve kokanee recruitment from the Swan River to maintain or improve the snag fishery downstream from Big Fork Dam and to improve the trolling fishery in Flathead Lake.

2. Provide adequate habitat conditions downstream from Big Fork Dam for rearing and reproduction of resident fish species such as rainbow trout to maintain or improve this resident fishery.

Wildlife

To protect, maintain and enhance the available supply of all species of wildlife and their habitat in the project area in order to meet the demand for all types of wildlife-oriented recreational pursuits.

Recommendations to Protect, Mitigate and Enhance Fish and Wildlife Resources

1. To meet the management goal of improving kokanee reproductive success and the kokanee snag fishery in the Swan River, it is necessary to investigate past mitigation attempts and operations of Big Fork Dam to determine if present practices should be continued, altered, or abandoned. Specific objectives include (1.1.4):

1. Document the effect a minimum flow of 40 cfs has on reproduction and incubation of kokanee salmon.

2. Document the effect a surge flow of 150-250 cfs, during the hours of 2:00 a.m. to 6:00 a.m. two or three days a week, has on migration, spawning and incubation success of kokanee.

3. Continue the practice of adding spawning-sized gravel downstream from Big Fork Dam and document if kokanee reproductive success is improved by this method.

4. Document if kokanee (or other fish) recruitment downstream out of Swan Lake is prevented by diversion through the Big Fork powerhouse and investigate measures to reduce entrainment (if needed).

Positive measures have been taken by Pacific Power & Light Company to improve kokanee reproduction. These measures include providing a minimum flow, providing surge flows over the dam to stimulate kokanee migration past the powerhouse, and placing spawning-sized gravel downstream from the dam. The effectiveness of these measures on kokanee reproduction should be determined. This information will allow decisions to be made whether to continue, modify, or abandon the programs in the future. Perhaps large numbers of kokanee migrate downstream out of Swan Lake but are entrained by the diversion and generators. Field investigations could determine if screening the intake structure is a beneficial measure to increase kokanee (and other game fish) recruitment.

2. *Maintain the present minimum flow of 40 cfs between Big Fork Dam and the powerhouse and document if this flow is sufficient to ensure successful reproduction and rearing of resident species such as rainbow trout (1.1.5).*

Rainbow trout are residents of the Swan River below Big Fork Dam and provide a unique fishery for this locale in Montana. Investigations should be done to determine if 40 cfs is sufficient to ensure successful reproduction and rearing of rainbow trout.

KERR PROJECT

Project Description

Kerr Dam is a 200 foot high concrete arch structure across Flathead River and is located 4.5 miles downstream from the outlet of Flathead Lake. The dam is located on Confederated Salish and Kootenai tribal lands. Kerr Dam, constructed primarily for hydropower, was closed in April of 1938. The license was amended and transferred from Rocky Mountain Power Company to the Montana Power Company in August, 1938. Three generation units were installed; one in 1939, one in 1949 and the last in 1954. Each unit has a 56,000 kilowatt generating capacity for a total of 168,000 kilowatts. The Kerr project is currently operating under a license which expired May 22, 1980. Montana Power Company and the Salish-Kootenai tribe have filed for relicensing (Federal Energy Regulatory Commission 1980).

Kerr Dam controls the water level of Flathead Lake between elevations 2883 and 2893 feet. This represents a storage capacity of 1,217,000 acre-feet. In most years, spring runoff produces a volume of water which not only refills the storage area, but also causes a continuous discharge over the dam for a month or more. The hydraulic capacity of the three generators is 14,346 cfs while the mean river discharge is 11,730 cfs. Lake elevations are also altered by Hungry Horse Dam upstream from the lake on the South Fork of the Flathead River. Hungry Horse Dam was closed in 1951 (Federal Energy Regulatory Commission 1980).

Project Operations

Operation of Kerr hydroelectric development is coordinated with that of other hydro resources of the Northwest Power Pool. Draft on storage usually begins in mid-September and reaches a maximum drawdown at the end of March or mid-April. In this period, use of storage releases from Hungry Horse Reservoir, together with those from Flathead Lake, makes generation possible at a plant factor of 75 to 80 percent. During remaining months of the year, generation depends on the volume of runoff available in excess of that required to refill reservoirs. In many years, the plant continues to operate at a high plant factor through May and June (Federal Energy Regulatory Commission 1980).

Because of natural channel restrictions between Flathead Lake and Kerr Dam, the maximum rate of discharge through the outlet channel when Flathead Lake is at elevation 2893 feet is 55,500 cfs. The historic rate of inflow has been as high as 176,000 cfs on June 9, 1964.

Because inflow, during periods of high runoff, can greatly exceed maximum outflow, drawdown on storage begins in mid-September to allow for flood control during spring. The maximum rate of outflow at drawdown (elevation 2883 feet) is 5,200 cfs because of natural channel restrictions in the lake outlet. If the plant relays off when not spilling, no flows will be released for a short time.

Montana Power Company relies on the Kerr project for the bulk of its systems load frequency control. This requires changing flow releases through the Kerr project on a very short time basis. This may involve going from a full to minimum load or vice versa in an emergency situation. Other operational constraints to optimize power output through the Kerr plant include filling the reservoir each summer and achieving maximum draft of the lake prior to spring runoff. Operational planning is based on a minimum daily average release of 1500 cfs (Montana Power Company 1981).

Kerr Dam is included in the Pacific Northwest Coordination Agreement. Stipulations in the agreement (Montana Power Company 1981) include:

1. Maintain Flathead Lake elevation in accordance with the energy content curve determined under the agreement. This agreement provides for operation of all major facilities on the Columbia River. The use of the energy content curve provides for maximizing the amount of hydroelectric energy production under most prudent constraints.

2. Operate below the energy content curve only if all reservoirs are at or below their energy content curves.

3. Release stored water above their energy content curves at the request of downstream users or provide "in-lieu" energy to replace the energy the water would have provided if it had been released.

4. Comply with numerous other conditions of this agreement.

On May 31, 1962, the Montana Power Company and the Corps of Engineers stated a "Memorandum of Understanding" which set further principles and procedures for regulation of Flathead Lake in the interests of flood control. This agreement provides that, conditions permitting, the lake will be drawn down to elevation 2,883 feet, the minimum water level under the license, by April 15 and raised to elevation 2,890 feet by May 30 and to elevation 2,893 feet, the maximum level under license, by June 15. When the lake reaches elevation 2,886 feet in a moderate or major flood year, the licensee will gradually open spill gates and not close them until after the danger of exceeding elevation 2,893 feet has passed. This agreement has been endorsed by a group of local landowners and recreationists (Federal Energy Regulatory Commission 1980).

The Montana Power Company currently has no definite plans for further development of the project and proposes to continue past operations. However, several options to increase energy output have been surveyed by government agencies and Montana Power Company. Options include; raising the dam and elevation of the reservoir, enlarging the lake outlet to increase maximum flow rate (at lake elevation 2,883) from 5,200 to 30,000 cfs, rewinding the present generators, and installing an additional generator (Federal Energy Regulatory Commission 1980).

FLATHEAD LAKE
STATE OF MONTANA

The remainder of this section on Kerr Dam is organized to present the concerns of the State of Montana and U.S. Fish and Wildlife Service on Flathead Lake and address the concerns of the Confederated Salish and Kootenai Tribes on the south half of Flathead Lake and Flathead River downstream from Kerr Dam which fall within the exterior boundary of the reservation. For clarity these sections have been kept separate. The Confederated Salish and Kootenai Tribes also present concerns for the Kootenai River in this section.

History of Fish and Wildlife Resources

Important native gamefish in Flathead Lake include bull trout, cutthroat trout, and mountain whitefish. These species are still abundant and have extensive spawning runs into the North and Middle Forks of the Flathead River, the last major tributaries not impounded. The closure of Hungry Horse Dam on the South Fork of the Flathead River in 1953 eliminated a large portion of the potential spawning tributaries for cutthroat and bull trout into Flathead Lake (Graham 1980; Graham et al. 1980c; Gaufin et al. 1976).

Bull trout provide a significant trophy fishery both in Flathead Lake and in tributaries when on their spawning migrations. Cutthroat trout provide an important fishery throughout the drainage. Mountain whitefish are abundant but not extensively utilized by fishermen (Graham et al. 1980c; Gaufin et al. 1976).

Kokanee provide the largest fishery in both the lake and river. Statewide mail surveys conducted in 1958 and 1975 showed that fishing pressure had doubled in Flathead Lake over that period (Montana Fish, Wildlife, Parks files, Kalispell). A census conducted on the lake from 1962 to 1964 estimated an average of 123,000 fisherman-days per year with kokanee representing 77 percent of the catch (Robbins 1966). Present annual pressure probably ranges from 100,000 to 200,000 fisherman-days per year on the lake (Graham et al. 1980a).

The river fishery was censused in 1975 and total pressure was estimated at 63,123 angler trips (Hanzel 1977). The fall and winter fishery from October to April comprised 45 percent of the total fishing pressure and 72 percent of the total catch. Kokanee were the primary sport fish in the fall and winter fishery.

The kokanee fishery can be classed in three categories. The largest is the lake trolling fishery comprised largely of three and four-year-old kokanee. The fishery is conducted from June through August.

Other fisheries for kokanee occur on their spawning migration and spawning grounds. Snagging of these mature fish with weighted treble hooks is the most common method of capture. This occurs in both river and lakeshore areas. From September through November, fishermen concentrate on the banks of the main Flathead River and portions of the lower Middle Fork. There are two main runs into the river. An early run in September is probably destined for the springs and lake outlets upstream from the regulated portion of the river. Another run follows in several weeks and probably makes up most of the spawning in the regulated Flathead River.

A snagging fishery also occurs on lakeshore spawning areas. This fishery occurs in the fall and is presently the smallest of the three fisheries. This was not the case historically, however. Following the introduction of kokanee in 1916, a fishery was recognized in the 1930's. Lakeshore snagging of kokanee on their spawning grounds was popular in the 1950's although initial surveys identified the potential problems of lake level drawdown during the incubation and emergence period (Stefanich 1954). Some spawning was also occurring in the river system including lake outlets and spring areas.

In the early 1960's, there was a shift from lakeshore spawning to river spawning (Hanzel 1964). A factor which could have influenced this was the construction of Hungry Horse Dam on the South Fork of the Flathead River in 1953. The warmer fall and winter discharges from Hungry Horse Dam have apparently attracted kokanee and provided conditions for successful spawning although incubation success can be quite variable because of flow fluctuations generated by Hungry Horse Dam. The relationship between this shift in spawning locations and changes in operations of Kerr Dam over the years is not clear.

Lake trout, another introduced species, provide a trolling fishery in Flathead Lake. Lake whitefish, also introduced, are abundant in the lake but are seldom caught. Largemouth bass and yellow perch, both introduced, are locally abundant in the lake and provide a diversified fishery.

Impacts on Fish and Wildlife

Fisheries

Historically, most kokanee spawning occurred along the shores of Flathead Lake with some additional spawning in McDonald Creek and Whitefish River (Stefanich 1952; 1953a; 1954). Later investigations showed a shift from a lake-based spawning population to a river-based spawning population (Hanzel 1964; Huston and Schumacher 1978).

Although the reason for the shift is not entirely clear, it does appear that operation of Kerr Dam may have limited successful lakeshore spawning or changed the historically observed patterns of spawning.

Prior to impoundment by Kerr Dam, water levels in Flathead Lake remained relatively constant from October, the beginning of the kokanee spawning period, through mid-April, when kokanee fry were emerging from shoreline gravels. Lake levels during fry emergence were generally within one foot of the water level during kokanee spawning the previous fall. Maximum lake levels were reached during spring runoff in May and June (Hanzel 1974).

Since impoundment, maximum water levels have been reached in May and maintained into the fall kokanee spawning period. Minimum water levels have been reached in mid-April, the time of fry emergency. Using November 14 as the approximate time at which kokanee spawn and April 1 as the approximate time of emergency, the following comparisons were made. Lake levels from 1939 (the year Kerr Dam was closed) to 1950 averaged 6.8 feet lower at the time of fry emergency than at the time of spawning and ranged from 1.0 to 9.1 feet lower. Since Hungry Horse Dam operations began in 1952, the mean fluctuation of lake levels have not changed appreciably; however, the range is now 4.2 to 8.5 feet (Graham and Schumacher 1979, Hanzel 1974).

The reduction in lakeshore recruitment of kokanee or a possible shift in timing or location of spawning have resulted in a significant decline in the lakeshore snagging fishery. A lakeshore snagging fishery was observed and censused by Stefanich (1954) and Robbins (1966). Since kokanee exhibit a strong homing instinct in returning to the areas they were hatched, large spawning concentrations are no longer available along the shore because of poor reproductive success in the lake. In recent years, little effort has been expended on snagging kokanee along the lakeshore.

Other important gamefish which spawn in the lake and may be impacted by water level fluctuations are lake trout and lake whitefish. Both of these species are fall spawners and little information is available on their habitat requirements in relation to water levels in the lake. Largemouth bass may also be negatively impacted by delayed filling of the lake in spring. Bass normally spawn in May and later filling dates delay spawning activity.

Wildlife

Impacts of Kerr Dam on wildlife are primarily related to seasonal water level management of Flathead Lake, including the timing of drawdown and refill. A primary concern has been nesting of waterfowl, in particular, Canada geese.

The main concern with nesting geese is fluctuating water levels during late February through April. Nest site selection by Canada geese in this area begins in mid to late February, with actual nesting beginning around March 10 and peaking about March 26. The peak of hatching occurs around April 25, but can extend into late May. Increasing water levels during this period can lead to flooding of low lying nests, while drawdown can expose island nests to mammalian predators.

Drawdown during the October - November period greatly reduces the amount of shallow water area, containing emergent and submerged aquatic vegetation, available to resident and migratory waterfowl. Fall drawdown also affects recreational use of the waterfowl resource by stranding duck and goose blinds with variable but generally large mud flats between blinds and open water.

Another concern is the direct loss of habitat for waterfowl, bald eagle, and osprey production due to erosion of the north shore of Flathead Lake. Since 1961, approximately 450 acres of shoreline and river bank habitats within the boundaries of the U.S. Fish and Wildlife Service's Flathead Waterfowl Production Area on the north shore have been lost to erosion (USFWS 1981). These losses resulted from restablization processes of the lake in response to manipulation of Flathead Lake water levels since the 1939 closing of Kerr Dam. Water level regulation affected sediment buildup, delta formation, and bank and island erosion from wave action which caused the habitat losses.

Mitigation of Project Impacts

To date, operations of Kerr Dam have not included constraints to benefit fisheries. The impact of the operation of Kerr Dam on the fishery of Flathead Lake is not clear and is probably a major reason that changes have not been made to enhance the fishery resource. No mitigation has been attempted for wildlife losses.

Management Goals and Objectives

Fisheries

Kokanee salmon have received the major management emphasis in Flathead Lake because they are the most abundant gamefish, are highly sought after, and provide the bulk of the fishery. For this reason, management goals are directed toward kokanee and include:

1. Provide optimum numbers, maximum distribution of fishable numbers, and a prolonged fishing period of kokanee by increasing the number of lake spawning areas and snagging areas, and increasing the population of kokanee in Flathead Lake.

2. Diversify the fishing opportunity by providing both snagging and an improved lake trolling fishery (by increasing reproductive success) for kokanee in Flathead Lake.

Wildlife

To protect, maintain and enhance the available supply of all species of wildlife and their habitats in the project area in order to meet the demand for all types of wildlife-oriented recreational pursuits.

Recommendations to Protect, Mitigate and Enhance Fish and Wildlife Resources

Fisheries

1. Results from a recently initiated kokanee study should be evaluated to determine measures which could be implemented to improve reproductive success of kokanee in Flathead Lake and provide a good lakeshore snagging fishery (1.2.2).

Funding has recently been secured from the Bonneville Power Administration to investigate the effect of operation of Kerr and Hungry Horse dams on the reproductive success of kokanee in the Flathead River-Lake system (Graham 1981a). The purpose of this study is to improve reproductive success of kokanee spawning in the lake and river to provide a more diverse and successful fishery. To do this, it is necessary to investigate the impacts of lake level fluctuations on the success of kokanee reproduction in Flathead Lake and determine to what extent other factors may have contributed to the decline in the lakeshore fishery. Specific study objectives include:

1. Investigate the effect of operation of Kerr and Hungry Horse dams on water levels in Flathead Lake and quantify effect of amount and timing of drawdown on distribution and reproductive success of kokanee spawning on Flathead Lake.

2. Delineate extent of successful shoreline spawning in Flathead Lake both on-shore (less than 20 feet in depth) and off-shore (greater than 20 feet in depth).

3. Quantify influence of ground water on incubation success of on-shore spawners in Flathead Lake subject to dewatering by lake drawdown.

Wildlife

Losses of production of waterfowl, bald eagles and osprey on Flathead Lake as a result of construction and operation of Kerr Dam should be estimated and, if necessary, a study should be funded to do so. Compensation for those losses may include providing artificial nest sites, especially islands that would be above the high water level, diking shallow water areas and erecting nesting platforms for raptors.

Amount of production lost for waterfowl, bald eagles and osprey on the U.S. Fish and Wildlife Services Flathead Waterfowl Production Area should be determined. Efforts to mitigate these losses would consist of intensive waterfowl management on the 2,371 acres of the Flathead Waterfowl Production Area could be used as a means to offset losses associated with lake water level manipulation by Kerr Dam. This management could be directed at increasing nesting opportunities for Canada geese and other waterfowl and bald eagles and osprey by construction of artificial nest sites, diking shallow water areas, and erecting nesting platforms for raptors.

Nesting sites should be protected against erosion and wave action in some manner (rip-rap, log booms, etc.) to prolong their life. As an alternative, floating and/or elevated nesting structures could be provided.

Delaying drawdown in the fall until sometime in late October or early November would alleviate most of the problems encountered at that time. However, changes in water level management at this time would need to be studied further and coordinated with project operations and operational constraints as well as with upstream water releases from Hungry Horse Dam and with fishery needs which are also affected by operations of these dams. Coordinated mitigation efforts such as this could solve problems for both fishery and wildlife without additional effort and expense. This warrants further exploration.

A study should be initiated to assess the potential areas around Flathead Lake where management of wildlife could be considered as mitigation of habitat lost by construction of Kerr Dam and make appropriate recommendations.

See Hungry Horse Dam - Wildlife Recommendations for a discussion.

SOUTH HALF FLATHEAD LAKE - LOWER FLATHEAD RIVER
CONFEDERATED TRIBES

The Confederated Salish and Kootenai tribes of the Flathead Indian Reservation have actively participated with state and federal Fish and Wildlife Agencies to formulate recommendations to be submitted to the Regional Power Planning Council for incorporation into its program to protect, mitigate and enhance fish and wildlife as mandated by the Pacific Northwest Power Planning and Conservation Act. The Tribes' comments deal primarily with Kerr Dam, the south half of Flathead Lake and the lower Flathead River as these are of greatest importance to the Tribes and are located within the exterior boundaries of the Flathead Reservation.

This draft only addresses current hydropower operation and new information will have to be gathered for any future energy developments. The Tribes understand that the Columbia River Basin Power grid puts constraints on how the operation of Kerr and Hungry Horse dams may be modified for fish, wildlife and recreation.

The following statements are divided into three segments. The first deals with the south half of Flathead Lake, the second deals with the lower Flathead River and the third addresses the Kootenai River. The first two segments include impact, goal, and recommendation statements concerning fish, wildlife, recreation, historical and cultural impacts. The last segment deals with the Tribes' cultural concern on the Kootenai River.

Fisheries-South Half Flathead Lake

Impacts on Fisheries

The species most visibly impacted by the operation of Kerr Dam is kokanee salmon. Initially, most kokanee spawning occurred along the shores of Flathead Lake, however, later investigations showed a shift from a lake based spawning population to a river based spawning population in the major tributaries to Flathead Lake. It is suspected that the operation of Kerr Dam has contributed to this shift in spawning habitat.

Anglers throughout the western United States and Canada visit Flathead Lake to fish for kokanee salmon. Because of a decrease in the number of kokanee salmon spawning along the shores of Flathead Lake, the Confederated Salish and Kootenai Tribes and local businesses have realized a loss in revenue that would have resulted from recreational and subsistence fishing.

Other game fish are affected by drawdowns resulting from the operations of Kerr Dam. How they are affected and the degree to which they are affected is unknown; thus a better understanding is needed for fisheries management. For example, some rearing areas for large mouth bass may be adversely affected by drawdowns. Also, tribal elders expressed there were annual migrations between the lake and the lower river providing excellent fishing at the outlet of Flathead Lake. These migrations stopped with the construction of Kerr Dam.

Fisheries Goal

To perpetuate, enhance and protect the aquatic species to meet both tribal and public needs consistent with the ecological integrity of the ecosystem.

Fisheries Objectives

To protect and enhance game fish populations and habitat to provide optimum recreational and subsistence fishing opportunities in Flathead Lake.

To reach a better understanding of the Flathead Lake fishery and how the different areas of the lake relate to one another.

To maximize kokanee salmon spawning conditions in Flathead Lake, yet minimize the impact on Kerr Dam's operation.

To better understand the operations of Kerr and Hungry Horse Dams so that associated problems may be mitigated.

To protect and enhance water quality.

To provide adequate forage fish population and habitat to meet the requirements of predatory fish and bird populations.

To work with concerned agencies to improve fisheries management.

Fisheries Recommendations

1. To obtain information on the operation of Kerr Dam including extremes in water level manipulation and to correlate this data with fish population needs.

2. To pursue a study to develop a better understanding of the existing and potential fisheries resources in the South Bay, to determine to what extent this shallow bay functions as a separate environment and to what extent it is used by fish species from the main body of Flathead Lake.

3. Kerr Dam should operate in such a fashion as to insure successful reproduction of kokanee salmon and other fish species while at the same time recognition should be given to the economic importance of hydropower to the Confederated Salish and Kootenai Tribes. Water levels within the lake should remain at an elevation which protects lake shore spawning.

4. The Bonneville Power Administration should fund a kokanee salmon study by the Montana Department of Fish, Wildlife and Parks. The Confederated Salish and Kootenai Tribes should provide input for the study design and implementation of results.

Wildlife-South Half Flathead Lake

Impacts on Wildlife

Wildlife may be impacted by energy developments, such as Kerr Dam, in many ways. Water level fluctuations and powerlines are examples. Species of special concern at Flathead Lake are white-tailed deer; fur bearers; bald eagles; osprey; waterfowl, particularly Canada geese; and non-game animals.

Water level fluctuations affect wildlife species both directly and indirectly. Canada geese may have their nests flooded or nesting islands exposed depending on the operation of Kerr Dam. Riparian and emergent vegetation may be either enhanced or eliminated, depending on the degree of water level fluctuations.

Riparian and emergent plants are critical habitat components for wildlife species such as fur bearers, ducks, geese, and swans. Loss of forage fish habitat due to water level manipulation will influence predatory bird populations. Water fluctuations may also affect raptors by changing fish vulnerability. Additional impacts on other species are poorly documented.

Wildlife Goal

To protect, perpetuate, enhance, and manage resident and certain introduced species at population levels consistent with their role in the ecosystem.

Wildlife Objectives

To manage wildlife species such as big game, upland game birds, furbearers, and non-game species at population levels that are consistent with recreational needs, tribal needs, and habitat capacity.

To perpetuate and enhance waterfowl production.

To protect and enhance raptor species, particularly nesting osprey as well as nesting and wintering bald eagles.

To manage predator species at a level consistent with their role in the ecosystem and compatible with surrounding communities.

To work with concerned agencies to improve wildlife management.

Wildlife Recommendations

1. Establish criteria for wildlife population levels and habitat requirements to meet tribal needs, including tribal subsistence hunting. Initiate and complete studies to accomplish this task.

2. Reduce water level fluctuations during the nesting period for Canada geese and other waterfowl and/or build suitable nesting structures.

3. Initiate a population study of bald eagles and their habitat selection during winter to properly manage this endangered species.

4. The Confederated Salish and Kootenai Tribes shall continue to participate in recovery plan implementations for threatened and endangered species.

5. Study to see if a change is needed in fall water drawdown to accommodate waterfowl hunting while not adversely impacting Kerr Dam operations.

Recreation-South Half Flathead Lake

Impacts on Recreation

Water level manipulations resulting from the operations of Kerr and Hungry Horse dams impact recreational activities. The shift in kokanee salmon spawning areas has caused a reduction in the number of sport fishermen. This loss has resulted in a negative impact on the economy of the Confederated Salish and Kootenai Tribes and reservation businesses. Waterfowl hunting is negatively affected by water drawdown when mud flats and areas around the shoreline are exposed. In addition, this exposure causes a degredation of the aesthetic quality of the lake.

Recreation Goal

To restore, maintain and enhance, to the greatest extent possible, a diversity of high quality recreational opportunities on the lands and waters impacted by the development and operation of Kerr Dam.

Recreation Objectives

To protect and enhance opportunities for fishing from the shore, by wading and motorized and non-motorized boating at levels necessary to meet public demand along Flathead Lake.

To protect and enhance opportunities for waterfowl and upland game bird hunting on those lands and waters on the Flathead Indian Reservation that are impacted by the development and operation of the Kerr and Hungry Horse Dams.

To protect and enhance opportunities for recreational boating at levels necessary to meet public demand along the lake.

To protect and enhance the high quality aesthetic values found on the Flathead Indian Reservation.

To protect and enhance water quality at levels suitable to insure high quality recreational opportunities.

Recreation Recommendations

1. Harvest data from hunters and fishermen should be obtained to monitor game and fish populations more accurately and formal interviews should be conducted to determine their characteristics and attitudes.

2. Develop methods to obtain baseline information on the timing, amounts, distribution, and types of uses that may affect fish and wildlife resources.

3. Correlate sensitive wildlife areas (waterfowl and raptor nesting sites) with the timing, distribution, and types of recreational uses.

4. Determine the recreational needs of tribal members.

5. Conduct an economic analysis of the value of recreational use.

Historical and Cultural Resources-South Half Flathead Lake

Impacts on Historical and Cultural Resources

The historical and cultural significance of Flathead Lake should not be overlooked. Dr. Carling I. Malouf of the University of Montana made a cultural resources reconnaissance of the Flathead Indian Reservation in 1960. His reconnaissance identified a large number of prehistoric sites on Flathead Lake. Dr. Malouf stated that the area around Flathead Lake and along the lower Flathead River may be the most important center of ancient life in western Montana, and that the entire area is so rich and dense in archeological sites that it could be considered one large site. Based on resource evaluations by Dr. Malouf, these sites probably represent a very significant data base for understanding Montana prehistory and the Native American population of the region. Any loss of these historical or cultural sites due to energy development would be a great injustice.

Historical and Cultural Resources Goal

To record and protect all historical sites and identify cultural needs of the Salish and Kootenai people.

Historical and Cultural Resources Objectives

To establish cirteria which will insure that all historical and cultural sites are protected in the future.

To identify the Indian people's cultural needs and uses of the lower Flathead River in modern times.

Historical and Cultural Resources Recommendations

1. *Interview tribal elders.*

2. *Explore the lake for historical and cultural sites.*

3. *Record, document, and protect sites.*

4. *Protect the Indian people's needs and uses of Flathead lake in modern times.*

Fisheries-Lower Flathead River

Impacts on Fisheries

The aquatic and riparian habitat downstream from Kerr Dam has been altered by the project's development and operation. When the dam is operated for peaking power, unregulated water level fluctuations adversely affect fish and invertebrate habitat and populations. During periods of extreme water level fluctuations, areas of the riverbed often dry up; aquatic insects and other food chain organisms decrease, adversely affecting the fishery. In addition, water temperatures on the lower Flathead River during the summer months can approach critical levels for salmonids.

Spawning, rearing and adult habitat, and fish migration in the lower Flathead and its tributaries are likely affected by Kerr Dam's operation. These are also problems in tributaries of the lower Flathead due to dewatering, irrigation return flows, water quality degradation and stream barriers.

Present conditions favor rough fish and it is doubtful that significant trout spawning habitat exists in the lower Flathead today, but it may be re-established with proper management. Northern pike and large mouth bass spawn in shallow areas, and consequently reproduction of these species could be adversely affected by the water level fluctuations.

Fisheries Goal

To perpetuate, enhance, and protect the aquatic species to meet both tribal and public needs consistent with the ecological integrity of the ecosystem.

Fisheries Objectives

To protect and enhance game fish populations and habitat to provide optimum recreational and subsistence fishing opportunities.

To reach a better understanding of the Flathead River fishery and how the different areas of the river and tributaries relate to one another.

To optimize northern pike, large mouth bass, and salmonid spawning, rearing, and adult habitat conditions yet minimize the impact on Kerr Dam's operation.

To better understand the operations of Kerr Dam so associated problems may be mitigated.

To protect and enhance water quality.

To provide adequate forage fish population and habitat to meet the requirements of predatory fish and bird populations.

To work with concerned agencies to improve fisheries management.

Fisheries Recommendations

1. To obtain information on the operation of Kerr Dam, including extremes in water level manipulation and to correlate this data with fish population needs and establish desirable flow regimes if necessary.

2. Pursue funding for northern pike, largemouth bass, and salmonid studies to develop a better understanding of existing and potential fisheries resources in the lower Flathead River and its tributaries.

3. Pursue the mitigation of fish habitat lost due to the operation of Kerr Dam should studies indicate that losses have occurred.

4. Kerr Dam should operate in such a fashion as to insure successful reproduction of important game fish species while at the same time recognition should be given to the economic importance of hydropower to the Confederated Salish and Kootenai Tribes.

Wildlife-Lower Flathead River

Impacts on Wildlife

Wildlife may be impacted by energy developments such as Kerr Dam in many ways. Water level fluctuations, removal of stream bank vegetation, and powerlines are examples. Species of special concern are mule and white-tailed deer; fur bearers, mainly beaver; bald eagles; osprey; red-tailed hawks; waterfowl, particularly Canada geese; and upland game birds, especially pheasants; and non-game animals.

Water level fluctuations affect wildlife species both directly and indirectly. Canada geese may have their nests flooded or nesting islands exposed depending on the operation of Kerr Dam. Riparian and emergent vegetation may be either enhanced or eliminated depending on the degree of water level fluctuations.

Riparian and emergent plants are critical habitat components for wildlife species such as fur bearers, ducks, geese, and swans. Loss of forage fish habitat due to water level manipulation will influence predatory bird populations. Water fluctuations may also affect raptors by changing fish vulnerability. Additional impacts on other species are poorly documented.

The trees along the Flathead River provide an important structural component to the vegetation. Construction of even low-head hydropower sites will necessitate the removal of all trees. This loss will affect wildlife species several miles from the river. For example, Canada geese and osprey nest in old-growth trees; bald eagles perch in them throughout the winter. White-tailed and mule deer use these forested areas for winter range. Loss of the forested bends will affect white-tailed deer over a large area beyond the river's edge.

Wildlife Goal

To protect, perpetuate, enhance, and manage resident and certain introduced species at population levels consistent with their role in the ecosystem.

Wildlife Objectives

To manage wildlife species such as big game, upland game birds, fur bearers, and non-game species at population levels that are consistent with recreational needs, tribal needs and habitat capacity.

To perpetuate and enhance waterfowl numbers and habitat.

To protect and enhance raptor species, particularly nesting osprey as well as nesting and wintering bald eagles.

To manage predator species at a level consistent with their role in the ecosystem and compatible with surrounding communities.

To work with concerned agencies to improve wildlife management.

Wildlife Recommendations

1. Establish criteria for wildlife population levels and habitat requirements to meet tribal and recreational needs, including subsistence hunting. Initiate and complete studies to accomplish this task.

2. Reduce water level fluctuations during the nesting period for Canada geese and other waterfowl and/or build suitable nesting structures.

3. Initiate a study of the bald eagle population and their habitat selection during winter in order to properly manage this endangered species.

4. Initiate a study of the diurnal habitat use and movements of white-tailed and mule deer to determine the importance of cover along the lower Flathead River.

5. The Confederated Salish and Kootenai Tribes shall continue to participate in recovery plan implementations for threatened and endangered species.

6. Determine if changes in water fluctuations would allow the establishment of riparian vegetation along the river.

Recreation-Lower Flathead River

Impacts on Recreation

Water level manipulations resulting from the operation of Kerr Dam can significantly impact recreational activities on the lower Flathead River. Boating is probably the most seriously affected activity although waterfowl hunting and fishing are also impacted. Aesthetic qualities are degraded when mud flats and shorelines are exposed. Extreme water level fluctuations threaten public safety below Kerr Dam.

Recreation Goal

To restore, maintain and enhance, to the greatest extent possible, a diversity of high quality recreational opportunities on the lands and waters impacted by the development and operation of Kerr Dam.

Recreation Objectives

To protect and enhance opportunities for fishing from the shore, by wading and motorized and non-motorized boating at levels necessary to meet public demand along the Flathead River.

To protect and enhance opportunities for waterfowl and upland game bird hunting on those lands and waters on the Flathead Indian Reservation that are impacted by the development and operation of Kerr Dam.

To protect and enhance the opportunities for recreational boating at levels necessary to meet public demand along the river.

To protect and enhance the high quality aesthetic values found on the Flathead Indian Reservation.

To protect recreational visitors from rapidly fluctuating water levels below Kerr Dam.

Recreation Recommendations

1. Harvest data from hunters and fishermen should be obtained to monitor game and fish populations more accurately and formal interviews should be conducted to determine their characteristics and attitudes.

2. *Develop methods to obtain baseline information on the timing, amounts, distribution and types of use that may affect fish and wildlife resources.*

3. *Correlate sensitive wildlife areas (waterfowl and raptor nesting sites) with the timing, distribution and types of recreational use.*

4. *Determine the recreational needs of tribal members.*

5. *Conduct an economic analysis of the value of recreational use.*

Historical and Cultural Resources-Lower Flathead River

Impacts on Historical and Cultural Resources

As with Flathead Lake, the historical and cultural significance of lower Flathead River should not be overlooked. Dr. Charling I. Malouf of the University of Montana made a cultural resources reconnaissance of the Flathead Indian Reservation in 1960. His reconnaissance identified a large number of prehistoric sites on Flathead Lake and the Flathead River. Dr. Malouf stated that the area around Flathead Lake and along the Flathead River between Polson and Dixon may be the most important center of ancient life in western Montana, and that the entire area is so rich and dense in sites that it could be considered one large archeological site. Sites downstream from Dixon occur less frequently; however, one of the largest sites associated with the Flathead River was identified downstream from Dixon.

The density of sites reported in the vicinity of the Flathead River indicated that there are probably a large number of prehistoric and historic cultural resources present that have not yet been identified. Based on resource evaluations by Dr. Malouf, these sites probably represent a very significant data base for understanding Montana prehistory and the native American population of the region.

Any loss of these historical and cultural sites due to energy development would be a great injustice.

Historical and Cultural Resources Goal

To record and protect all historical sites and identify cultural needs of the Salish and Kootenai people.

Historical and Cultural Resources Objectives

To establish criteria which will insure that all historical and cultural sites are protected in the future.

Identify the Indian people's cultural needs and uses of the lower Flathead River in modern times.

Historical and Cultural Resources Recommendations

1. *Interview tribal elders.*

2. *Explore the river for historical or cultural sites.*

3. *Record, document, and protect historical and cultural sites.*

4. *Protect the Indian people's needs and uses of Flathead Lake in modern times.*

On-Site and Off-Site Mitigation

To the knowledge of the Confederated Salish and Kootenai Tribes, on-site or off-site mitigation has not taken place on either the Flathead River or the south half of Flathead Lake.

No changes in Kerr Dam's operation to improve the fish and wildlife resource has been noted.

KOOTENAI RIVER

The Confederated Salish and Kootenai Tribes are opposed to any alteration of the Kootenai River because of its special cultural importance to the Kootenai people. Currently cultural and spiritual sites are being identified to enable their protection. The Tribes are also concerned about preservation of the white sturgeon and its habitat.

The following resolution was passed by the Tribal Council of the Confederated Salish and Kootenai Tribes of the Flathead Reservation.

RESOLUTION OPPOSING KOOTENAI FALLS DAM

WHEREAS, the Northern Lights Electric Co-op is proposing to build a dam at Kootenai Falls on the Kootenai River near Libby, Montana, and,

WHEREAS, the site is in the aboriginal hunting and fishing grounds of the Confederated Salish and Kootenai Tribes, and,

WHEREAS, P.L. 95-341 (92 Stat. 469), the American Indian Religious Freedom Act, guarantees Native Americans the inherent right to free exercise of their religion, and,

WHEREAS, it is the site of one of the last Kootenai Vision Quest sites in Northwest Montana and its destruction would infringe upon the Kootenai people's freedom of religion, and,

WHEREAS, there are 15 archeological sites in the area to be inundated 10 of which are prehistoric, now, therefore,

BE IT RESOLVED, by the Tribal Council of the Confederated Salish and Kootenai Tribes that for the above reasons the Tribes are opposed to the construction of Kootenai Falls Dam.

C E R T I F I C A T E

The foregoing Resolution was adopted by the Tribal Council of the Confederated Salish and Kootenai Tribes on the 6th day of July, 1979, with a vote of 9 for 0 opposed and 0 not voting, pursuant to the authority vested in it by Article VI, Section 1 (a), (c) and (u) of the Tribes Constitution and Bylaws; said Constitution adopted and approved under Section 16 of the Act of June 18, 1934 (48 Stat. 984) as amended.

Thomas E. Pablo
Chairman, Tribal Council

ATTEST:

Fred Houle
Tribal Secretary

SUMMARY STATEMENT

The Confederated Salish and Kootenai Tribes, with assistance from the Bureau of Indian Affairs' Wildlife Branch and Tribal Recreation and Fisheries Departments, has entered an era of cooperation with the State of Montana and other entities. This step will provide a base on which the Confederated Salish and Kootenai Tribes will be able to protect and enhance the environmental quality of two of the most important resources found on the Flathead Indian Reservation, the lower Flathead River and the south half of Flathead Lake.

The Confederated Salish and Kootenai Tribes are supportive of the goal statements that define the mission of the Northwest Planning Council direction. These goals are as follows:

The mission of the Northwest Planning Council is threefold:

To provide accountable leadership in electricity planning and policy formulation for the Pacific Northwest;

To plan for the management of electricity demand and supply to sustain a healthy and growing economy and a healthy environment at the lowest total cost;

To secure regional consensus on energy development and utilization.

Therefore under the authority of P.L. 96-501 and the appropriate state laws, the Council will pursue the following goals:

--To provide an adequate, reliable and cost effective supply of electricity.

--To protect and enhance environmental quality.

--To secure implementation of all cost effective electricity conservation.

--To stimulate the development and implementation of cost effective renewable and alternative energy resources, both as a source of electricity and as a substitute for electricity.

--To increase the stocks of anadromous fish on the Columbia River and its tributaries, balancing the needs of the region for both fish and power production.

--To review the cost effectiveness of the basic assumptions underlying the planning and operation of the region's electricity supply system.

--To provide public education about regional electric power issues, particularly future rate impacts.

--To facilitate and encourage public participation in resolution of these issues.

--To maintain low rates made possible by the hydropower development in the Pacific Northwest while stimulating investment and consumption decisions as if rates reflected the high costs of new thermal resources.

--To provide a stable planning environment for prompt, conclusive decisions on electric energy issues.

--To prepare a demand forecast with sufficient end use detail so that conservation progress can be monitored and evaluated on a continuing basis.

--To identify and eliminate institutional barriers to the implementation of cost effective conservation and renewable resources.

--To develop a reliable power plan which realistically can be supported by the regional economy and national capital markets.

Many of the Tribes' goals, objectives, and recommendations parallel that of the Montana Department of Fish, Wildlife, and Parks.

CLARK FORK RIVER BASIN

BASIN DESCRIPTION

Geography

The Clark Fork rises in the Silver Bow (or Highland) Mountains south of Butte, Montana and flows northwestward approximately 350 river miles to Lake Pend Oreille in northern Idaho. The portion of the Clark Fork Basin in Montana encompasses an area of 22,000 square miles. The basin is mountainous with the Mission, Swan, Bitterroot, and Cabinet mountain ranges lying wholly or partly within its boundaries. A few peaks exceed elevations of 10,000 feet above sea level. The drainage is covered with large forested tracts, the continuity of which is broken by grazing and cropland areas which are situated in valleys at lower elevations.

Over 150 tributaries drain into the Clark Fork in Montana. The largest include the Flathead, Bitterroot and Blackfoot rivers which enter the Clark Fork River 106, 212 and 226 river miles upstream from Lake Pend Oreille, respectively. These three rivers account for half of the drainage area in the Clark Fork River system (Table 5).

The five largest cities in the drainage are Butte, Missoula, Anaconda, Kalispell and Deer Lodge. The Clark Fork Basin has been widely known for its mining and smelting industries. The copper mines at Butte and smelters at Anaconda (which recently shut down) are internationally famous. An aluminum reduction plant is located in the town of Columbia Falls near Glacier National Park. Logging, lumbering and paper manufacturing are industries supported by forests of the basin. The tourist trade is a large contributor to the economy. The basin is nationally known for its scenic beauty, fishing, hunting and other recreational features. Agriculture is an important industry in the basin.

A total of eight hydropower dams are located on the Clark Fork drainage in Montana. Flint Creek Dam is located at the outlet of Georgetown Lake, 38 miles upstream from the mouth of Flint Creek. Milltown Dam is located on the main stem of the Clark Fork, 225 miles upstream from Lake Pend Oreille (just upstream from Missoula). Three main stem dams exist on the lower Clark Fork River; Thompson Falls, Noxon Rapids and Cabinet Gorge, 70, 31, and 11 miles upstream from Lake Pend Oreille, respectively. Three projects are located on the Flathead River system (see Flathead River Basin)(Figure 3).

Hydrology

The Clark Fork-Pend Oreille River system is one of the major tributaries of the Columbia River as it contributes over 13 percent of the annual runoff of the Columbia River at The Dalles, Oregon. The Clark Fork Basin in Montana supplies 10 percent of the runoff to the Columbia River

Table 5. Drainage area and discharge for the period of record at U.S. Geological Survey gauging stations on the Clark Fork River system.

Station	Drainage Area (mi^2)	Discharge (cfs)		
		Mean	Maximum	Minimum
Flint Creek	208	99	1,680	15
Clark Fork at Drummond	2,378	709	8,490	58
Rock Creek	885	595	5,520	45
Blackfoot River	2,290	1,653	19,200	200
Bitterroot River	1,049	933	11,500	71
Clark Fork below Missoula	9,003	5,496	52,800	388
Flathead River near Polson	7,096	11,740	82,800	5
Clark Fork below Cabinet Gorge Dam	22,073	22,380	153,000	762

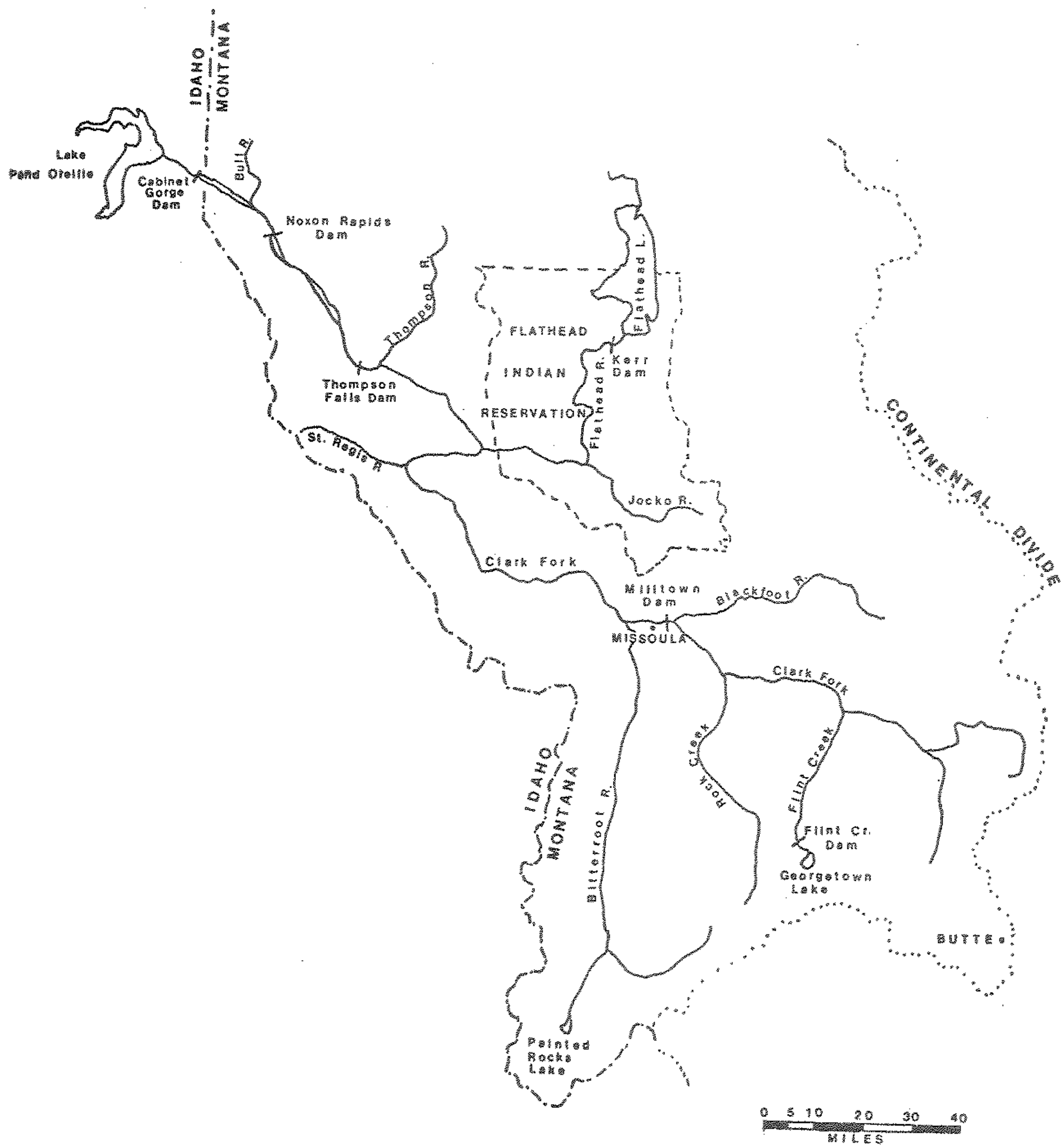

Figure 3. Map of Clark Fork drainage.

measured at The Dalles. Average annual stream flow of the Clark Fork near the Montana-Idaho line is 22,380 cfs. The drainage area is 22,073 square miles (Table 5).

One of the 150 tributaries to the Clark Fork, the Flathead River, supplies over 50 percent of the average annual flow. The next two largest tributaries, the Blackfoot and Bitterroot rivers supply seven and four percent of the average annual discharge, respectively (Table 5). The average gradient of the main stem Clark Fork in Montana is 10 feet per mile.

Mean annual precipitation in the basin ranges from 11 to 20 inches. Temperatures can be extreme; -30° F to 100° F ranges have been recorded in some sub-basins. The average growing season ranges from 39 to 137 days (U.S. Department of Interior, Bureau of Reclamation 1959).

The bulk of the stream flow in the Clark Fork system is stored as snow. May and June produce nearly 50 percent of the annual runoff. About 70 percent of the annual runoff occurs during the four-month period, April through July.

The four main stem dams on the Clark Fork River contain little storage capacity and have little influence on seasonal discharge patterns. Two major storage projects on the Flathead River system, Kerr and Hungry Horse dams, do have potential to noticeably alter magnitudes of flow seasonally in the Clark Fork.

Recreation Use

Excluding the Flathead River system (see Flathead River Basin), three tributaries to the Clark Fork are classified as Class I streams (highest fishery resource value; see Appendix C for definition). These include Rock Creek, Blackfoot River and Fish Creek.

Rock Creek is one of the most highly valued and popular trout streams in Montana. The sub-basin is nationally renowned and supports heavy angling pressure during the summer season. Because angling pressure has been so high, special restrictive regulations have been in force in recent years (Workman 1981).

The Blackfoot River drainage is extensively used for fishing, floating, and camping. Many Missoula County residents use the Blackfoot for recreation, accounting for 60 percent of the total use. Over 80 percent of those who use the river fish (Walker 1977). A recreation corridor was established on the river in 1975 whereby local government and landowners cooperate in managing the river for recreation. The Blackfoot River is the most heavily floated river in westcentral Montana.

Fish Creek is a small tributary with high quality trout habitat which drains directly into the main stem Clark Fork about 20 miles downstream from Missoula. The stream supports self-sustaining resident populations of rainbow and cutthroat trout and migratory runs of rainbow and bull trout from the Clark Fork River. The stream is heavily used by regional fishermen.

A significant fishery also exists in the 2,768 acre Georgetown Lake on Flint Creek. Georgetown Lake receives extremely heavy angling pressure both during summer and winter. Fishermen catch rates are among the highest in the state (Workman, D.L. 1981, personal communication).

Other important tributaries of the Clark Fork which support a trout fishery but may be somewhat less productive because of altered habitat, poor stream flow, or other factors include the Bitterroot, St. Regis and Thompson rivers. These streams are all rated as Class II (high priority fishery resource value).

The main stem of the Clark Fork throughout most of its length is rated as a Class II stream because of its fishery resource value. The river provides significant recreational opportunities which consist primarily of fishing and boating or rafting. Historically, the Clark Fork has had water quality problems from heavy metal pollution (from mine tailings in the upper drainage), industrial pollution and domestic sewage. Pollution abatement has occurred through much of the drainage resulting in the return of a significant trout fishery in the upper one-half of the drainage where fish could not previously survive.

Fish and Wildlife Resources

Rainbow and brown trout probably rank as the most abundant and sought after trout species in the Clark Fork drainage. Cutthroat and brook trout are locally abundant in tributary streams. Mountain whitefish are abundant throughout the drainage and provide a winter fishery. Migratory bull trout are found throughout the drainage in small numbers. Kokanee salmon and rainbow trout provide a large portion of the fishery in Georgetown Lake. Lake whitefish are common in the lower two main stem reservoirs. Warm water species such as yellow perch and largemouth bass are found locally throughout the drainage. Northern pike are found in the lower three reservoirs. A list of fish species and their distribution is given in Table 6.

For a description of wildlife species present see description of Flathead River Basin.

Table 6. Distribution of fish species in the Clark Fork drainage of Montana excluding the Flathead River system (Huston 1981a; Workman 1981).

Common name	Scientific Name	
Westslope cutthroat trout	*Salmo clarki lewisi*	Tributaries and reservoirs
Rainbow trout	*Salmo gairdneri*	Throughout drainage
Brown trout	*Salmo trutta*	Throughout drainage
Bull trout	*Salvelinus confluentus*	Scattered throughout drainage
Brook trout	*Salvelinus fontinalis*	Tributaries
Kokanee	*Oncorhynchus nerka*	Georgetown Lake
Mountain whitefish	*Prosopium williamsoni*	Throughout drainage
Lake whitefish	*Coregonus clupeaformis*	Noxon Rapids, Cabinet Gorge
Arctic grayling	*Thymallus arcticus*	Heart Lake, Fuse Lake
Northern pike	*Esox lucius*	Lower drainage
Yellow perch	*Perca flavescens*	Throughout drainage
Largemouth bass	*Micropterus salmoides*	Throughout drainage
Black bullhead	*Ictalurus melas*	Lower drainage
Pumpkinseed	*Lepomis gibbosus*	Throughout drainage
Northern squawfish	*Ptychocheilus oregonensis*	Throughout drainage
Peamouth	*Mylocheilus caurinus*	Throughout drainage
Redside shiner	*Richardsonius balteatus*	Throughout drainage
Longnose dace	*Rhinichthys cataractae*	Throughout drainage
Longnose sucker	*Catostomus catostomus*	Throughout drainage
Coarsescale sucker	*Catostomus macrocheilus*	Throughout drainage
Slimy sculpin	*Cottus cognatus*	Throughout drainage
Mottled sculpin	*Cottus bairdi*	Throughout drainage
Burbot	*Lota lota*	Planted in Noxon Rapids Reservc r in 1971

FLINT CREEK PROJECT

Project Description

Flint Creek is a high-head project located on Flint Creek 38.8 miles upstream from its confluence with the Clark Fork River. It was originally built by the Anaconda Copper Mining Company in 1905 and utilizes Georgetown Lake as its forebay. Georgetown is a shallow lake with a surface area of 2,768 acres and a useable storage of 31,000 acre-feet. The Flint Creek hydroelectric plant has two generators with a total installed capacity of 1,100 kilowatts, through a gross head of 718 feet (U.S. Department of Interior, Bureau of Reclamation 1959). The Montana Power Company bought the plant facilities from the Anaconda Company in 1912.

Project Operations

The Flint Creek Project has the potential to draw Georgetown Lake down 10 to 15 feet; however, because the lake is so large compared to the drainage area, drawdown is usually limited to three feet to allow refilling of the lake. Drafting of the lake usually occurs during winter to provide energy, provide storage room for spring runoff, and to limit ice damage. A flow of 30 cfs must be released at the request of downstream users for the purpose of irrigation during May 1 to October 1. Anaconda Company has the ability to divert water into or out of Georgetown Lake (Montana Power Company 1981).

History of Fish and Wildlife Resources

Numerous fish species have been planted over the years, but the species which comprise the bulk of the fishery at present include self-sustaining populations of kokanee salmon and brook trout. A healthy population of rainbow trout is maintained through annual hatchery planting. Georgetown Lake is very productive and supports one of the most intensive lake fisheries in Montana (Workman 1981).

The Flint Creek Dam impounded a hay meadow with only a small amount of riparian habitat being lost. Wildlife affected by this habitat loss would have been primarily nongame species, with minor effects on furbearers. Waterfowl populations probably benefited from impoundment.

Impacts on Fish and Wildlife

The drawdown of three feet on Georgetown Lake for the operation of Flint Creek hydroelectric project has, by itself, not adversely impacted the fisheries in the lake. Georgetown Lake is a shallow, productive lake with extensive growths of submerged vegetation. Winter fish kills have occurred during periods of ice and snow cover which prevented light from reaching plants. As a result, respiration by plants and animals and decomposition of organic matter depleted available oxygen in the in the water while photosynthesis was not recharging oxygen levels. Fish kills resulted from low oxygen levels. Drawdown during winter accentuates the problem by decreasing the volume of water which can store oxygen. Generally, during years when winter drawdown was limited to three feet, winter fish kills were not a problem.

Flint Creek Project has generally used three feet of storage during its winter operation. In past years, Anaconda Company, which owns water rights in Georgetown Lake, has diverted water from the lake during winter and resulted in total winter drawdowns in excess of three feet. It was during these years that winter fish kills were a problem. In recent years, the Anaconda Company has not withdrawn water during the winter and fish kills have not occurred. Presently, the Anaconda Company is trying to sell its water rights in the Flint Creek drainage.

Mitigation of Project Impacts

Mitigation for fisheries has not been attempted on the Flint Creek Project as past operations have not warranted such action.

Mitigation for loss of wildlife resources has not been attempted.

Management Goals and Objectives

The fish management goal for the Flint Creek Project is to maintain and improve the significant fishery in Georgetown Lake. Specific objectives include: 1) providing maximum numbers of rainbow trout 12 to 14 inches in length; and 2) providing optimum numbers of kokanee of an acceptable length range.

The wildlife management goal is to protect, maintain, and enhance the available supply of all species of wildlife and their habitat in the project area in order to meet the demand for all types of wildlife-oriented recreational pursuits.

Recommendations to Protect, Mitigate and Enhance Fish and Wildlife Resources

1. To maintain habitat conditions suitable for the survival of salmonids in Georgetown Lake, future operations of the Flint Creek Project should not be altered from past practices without considering and incorporating the needs of the fishery in those plans (1.2.3).

MILLTOWN PROJECT

Project Description

Milltown Dam is located on the Clark Fork River seven miles upstream from Missoula, Montana, and 225 miles upstream from Lake Pend Oreille. It was originally constructed in 1906-07 with four, 600 kilowatt generating units. A fifth unit of 640 kilowatt capacity was added in 1926 making the total plant capacity of 3,040 kilowatts. This is a low head, run-of-the-river development with the powerhouse forming a section of the dam. The spillway portion of the dam is a 216-foot long rockfill timber crib structure. A sluice section and a gravity wall section complete the dam which creates a small reservoir backing water both up the Clark Fork and Blackfoot rivers. The reservoir is heavily silted, and its reduced storage capacity is approximately 300 acre-feet. Maximum depth of the reservoir is approximately 30 feet. The project was licensed by the Federal Power Commission in 1965 and is effective until 1993 (Federal Energy Regulatory Commission 1980).

Project Operations

The Milltown Dam is a run-of-the-river project. Excessive water during periods of high flow are passed over the spillway or through the sluiceway. To increase the head, eight-foot high, wooden flashboards are raised on the crest of the dam. Prior to spring runoff, the flashboards are lowered to accommodate high flows over the spillway. After recession of high flows (usually in July), the water surface elevation in the reservoir is lowered to the crest of the dam whereupon the flashboards are again raised. The hydraulic capacity of the plant is 2,000 cfs while mean daily discharge of the Clark Fork upstream from Missoula is 3,020 cfs (Pickett 1981, U.S. Geological Survey 1980).

Because Milltown Dam is old and constructed of wood, maintenance is often needed. To make necessary inspections and repairs, it is periodically (once every few years) necessary to draft the reservoir up to 22 feet. Large mud flats are exposed during this drawdown which occurs at the onset of spring runoff and large quantities of silt and organic matter are discharged.

History of Fish and Wildlife Resources

Gamefish native to the Clark Fork drainage include cutthroat trout, bull trout, and mountain whitefish. Prior to construction of main stem dams on the Clark Fork in the early 1900's, bull trout had large spawning migrations up the Clark Fork which extended to the Missoula and probably Butte areas. The Salish Indians congregated in the Missoula area each year and took advantage of the seasonal concentrations of bull trout (Malouf 1975). Westslope cutthroat trout are migratory throughout their range including the Flathead River system (Graham et al. 1980c). Historically, these spawning migrations also occurred in the upper Clark Fork drainage.

Gold was discovered in the upper drainage in 1864 and since that date mining has been an important industry. In 1902, a copper smelter was built in Anaconda. Drainage through mine tailings introduced heavy metals into the Clark Fork River and became such a serious problem that by the early 1950's, the main stem was devoid of fish life from Rock Creek upstream (Columbia River Basin Interagency Committee 1957). Pollution abatement programs were initiated in the early 1970's and resulted in such a dramatic improvement in water quality that a significant brown and rainbow trout fishery soon developed (Workman 1981). Presently, these two trout species, along with mountain whitefish, are the most important game species in the upper Clark Fork River.

Impacts on Fish and Wildlife

Milltown Dam, built in 1906, was the first impoundment on the main stem of the Clark Fork River. Upstream migrations of fish were totally blocked by this structure. Migratory bull and cutthroat trout were the species most likely impacted. Lake Pend Oreille, 225 miles downstream, may have been the source of a large number of the migratory fish, similar to the current situation in Flathead Lake-River system.

The small reservoir behind Milltown Dam is almost entirely filled by sediment. During the deep drawdown for inspection (22 feet) and to a much lesser degree during the annual operational drawdown (8 feet), organic matter and sediment is discharged into the Clark Fork downstream from the dam. Fish populations downstream from Milltown Dam appear to be depressed compared to other areas in the main stem of the Clark Fork (Peters 1981). Marcoux (1970) attributed a high mortality of trout held in cages downstream from the dam to either extensive discharges of sediment released during the deep drawdown or to high levels of heavy metals associated with the sediment.

The flooded area once served as winter range for white-tailed deer, and was probably utilized by ruffed grouse as well as furbearers and nongame species. Negative affects would have been as previously described for these species.

Contrary to the effects on other species, the Milltown Dam has created some prime waterfowl habitat and water level fluctuations are not so large as to eliminate emergent vegetation. Waterfowl nesting could be enhanced through the provision of secure nesting sites, either floating or elevated platforms or the construction of islands. Canada geese have been transplanted here in the past and attempts are being made to establish a resident breeding population.

Mitigation of Project Impacts

No attempt has been made to mitigate for the blockage of migratory runs of fish in the Clark Fork River. Dams constructed downstream from Milltown are now blocking runs of migratory fish which originate in

Lake Pend Oreille.

Operational procedures at Milltown Dam have not, historically, included constraints for the benefit of fish and wildlife. Perhaps the major reason is that fish populations were depressed by other upstream water quality problems for a long period of time. Since pollution abatement has occurred in the drainage upstream from the project, the impacts from the operation of Milltown Dam have become more important.

Mitigation for wildlife losses has not been attempted.

Management Goals and Objectives

The fish management goal is to increase fishing opportunity in the Missoula area. The fish management objective related to the Milltown Project is to improve water quality and habitat conditions in the Clark Fork River below the dam for the purpose of increasing populations of brown and rainbow trout to within the potential expected for a river this size.

Recommendations to Protect, Mitigate and Enhance Fish and Wildlife Resources

Montana Power Company is presently developing a long range plan to determine future operations, maintenance and rehabilitation of Milltown Dam in light of present and future economic conditions and environmental impacts. Recommendations on whether the project should be upgraded, maintained, or abandoned will be developed during 1982. Operational procedures to minimize environmental impacts will also be included in the plan.

1. Upon completion of the preliminary problem identification stage of the long-range planning process in 1982 (1,2,4):

a) An evaluation by the Montana Department of Fish, Wildlife and Parks should be made to determine if the recommended measures adequately protect the fishery resource downstream from the project.

b) A study, if needed, should be conducted to evaluate the adequacy of the recommended measures on the fishery resource below the dam. This study would measure suspended sediments, heavy metals, fish abundance and growth, and macroinvertebrate populations.

THOMPSON FALLS, NOXON RAPIDS AND CABINET GORGE PROJECTS

Project Descriptions

Thompson Falls, Noxon Rapids and Cabinet Gorge are three run-of-the-river projects. The projects are located on the lower 70 miles of the Clark Fork River upstream from Lake Pend Oreille. Thompson Falls Dam, the upstream most project, was constructed in 1916. Cabinet Gorge Dam, 11 miles upstream from Lake Pend Oreille, is in Idaho just across the Idaho-Montana border and was constructed in 1952. Noxon Rapids Dam is located between the other two projects 31 miles upstream from Lake Pend Oreille, and was constructed in 1959.

Thompson Falls Dam is located on the Clark Fork River (a navigable waterway) near the town of Thompson Falls in Sanders County, Montana. The dam is situated 69 miles upstream from Lake Pend Oreille. The project consists of a 1,016 foot long and 54 foot high (maximum) concrete gravity main dam; a 449 foot long and 45 foot high concrete gravity auxilary dam located across two "islands" between the powerhouse and the main dam; a 450 foot long and 80 foot wide power canal cut through rock; a powerhouse containing six 5,000 kilowatt generating units; six 6.67 foot diameter steel penstocks and a 12 mile long reservoir with a useable storage capacity of 15,000 acre-feet. Construction on this power generation project began in 1913 with the first and sixth generating unit coming on line in 1913 and 1917, respectively. Montana Power Company acquired the Thompson Falls project from Thompson Falls Power Company in 1929 and has been operating it continuously since that time as part of its integrated electric system. The project is located 125 miles downstream from Kerr Dam and 165 miles downstream from Milltown Dam.

Noxon Rapids Dam is located 38 miles downstream from Thompson Falls Dam and is also in Sanders County, Montana. The project is owned and operated by Washington Water Power Company. The dam is 4,910 feet long and 180 feet high and consists of three segments. The central segment is a concrete gravity section with a grated spillway and power intake, and the two abutting segments are earth embankments. The five-generating-unit powerhouse has a total nameplate capacity of 397 MW. The 38 mile long reservoir has a total and active storage capacity of 495,000 and 230,000 acre-feet, respectively. The storage capacity is classified as seasonal. Maximum depth of the reservoir at full pool is 158 feet. The surface area of the reservoir at maximum and minimum pool elevations are 7,920 and 4,950 acres, respectively. The five intakes are 72 feet below maximum pool elevation. The hydraulic capacity of the plant is 50,000 cfs while the average annual stream flow is 21,470 cfs (Woodworth 1981, Federal Energy Regulatory Commission 1980).

Cabinet Gorge Dam is located 20 miles downstream from Noxon Rapids Dam and is also owned by Washington Water Power Company. The concrete arch dam, with gravity abutment sections, is 375 feet long and 140 feet high. Eight vertical lift spillway gates increase the height of the project an additional 68 feet. The powerhouse, located about 300 feet downstream, contains four turbine-generator units, each of 50 MW capacity. The 3,200 (full pool) acre reservoir extends upstream to the Noxon Rapids Project. Maximum depth at full pool is 125 feet. Total storage capacity of the project is 104,500 acre-feet, while active storage is 42,700 acre-feet. The hydraulic capacity of the plant is 34,300 cfs, while average annual stream flow is 22,380 cfs (Federal Energy Regulatory Commission 1980, Woodworth 1981).

Project Operation

Thompson Falls

The Thompson Falls project has been operated to serve base loads, and generation at this run-of-the-river plant depends upon the natural river flow. The 15,000 acre-feet of storage at the site would not normally be utilized since the large drawdown of the reservoir would decrease the effective head available and therefore reduce the capacity of the plant. Currently, reservoir level and spill are controlled by adding and removing flashboards at the main and dry channel dams. Flashboards are removed prior to spring runoff and are not replaced until normal summer flow. Because of this, up to 13 feet of head are lost for two to three months each year. The average annual flow of the Clark Fork near Plains, Montana, is 20,100 cfs, while the present hydraulic capacity of the plant is 11,100 cfs (Federal Energy Regulatory Commission 1979, Columbia River Water Management Group 1981).

Montana Power Company obtained permission to modify the taintor gate system in its new license issued December 28, 1979. The company proposed to install two remotely operated taintor gates and replace the top eight feet of the existing flashboard systems on both dams with timber drop panels and convert the existing flashboards stanchions to a tripable type. These modifications would allow Montana Power Company to hold the reservoir at its normal full level during a greater portion of the year than is presently possible and, as a result, to increase power production by an estimated 32 million kilowatt hours annually (Federal Energy Regulatory Commission 1979).

Montana Power Company is also considering the addition of one generating unit housed in a single new powerhouse. The size range of the new unit would be 50 MW, while the existing plant is rated at 40 MW. The nominal hydraulic capacity of the new plant will be 12,000 cfs. Two operational alternatives are being considered for the potential powerhouse additions. One plan involves continued operation as a run-of-the-river plant with only inadvertent fluctuations in reservoir water levels similar to present conditions. The second plan is to convert to peaking or load shaping operations. This would involve using a portion of the storage in the reservoir to supplement the normal river flow on a scheduled basis (Sullivan 1980).

Noxon Rapids

The "seasonal" storage of Noxon Rapids Reservoir allows the project to operate as a peaking plant within the confines of river flows. The reservoir and power station are operated on a weekly cycle throughout most of the year. That is, water is released from storage during daytime hours on weekdays to meet heavy load requirements and is replaced during "graveyard" hours on weekdays and throughout the weekends when load requirements are lighter. Maximum allowable daily drafting is two feet and weekly drawdown is 10 feet. Average operations are one foot daily and three feet weekly. The project's seasonal drawdown of 36 feet is planned to begin in late winter and to continue until the spring runoff begins, normally in late April. The seasonal drawdown is generally one-half of the respective allowable maximums. However, drafting of the reservoir is usually not done unless required by the Pacific Northwest Coordination Agreement (Woodworth 1981).

Cabinet Gorge

Cabinet Gorge, a run-of-the-river project with limited storage capacity, operates as a satellite plant of the Noxon Rapids project. As a result, daily and weekly fluctuations are generally the result of upstream operations and are about two and three feet, respectively. Maximum possible drawdown is 15 feet (Woodworth 1981). Operation of Cabinet Gorge prior to construction of Noxon Rapids Dam (1952-1960) resulted in daily and weekly water level fluctuations of three and 14 feet, respectively (Huston 1965).

Washington Water Power Company provides a voluntary minimum flow of 3,000 cfs through the Cabinet Gorge project (Woodworth 1981).

History of Fish and Wildlife Resources

Historically, the Clark Fork River was a major corridor and spawning ground for fish migrating out of Lake Pend Oreille, Idaho, a fishery of national renown. Important species include the westslope cutthroat trout, bull trout, lake whitefish and kokanee. All of these species had spawning migrations into the Clark Fork drainage (U.S. Fish and Wildlife Service 1966, Vanek 1972).

Residents who fished the lower Clark Fork drainage in Montana prior to construction of Cabinet Gorge Dam indicated that fishing on the main stem was generally unproductive except at concentration areas during periods when fish migrated out of Lake Pend Oreille. The mainstem fishery of particular importance was the snag fishery for kokanee at Thompson Falls and Heron Rapids, 68 and 15 miles upstream from Lake Pend Oreille, respectively. Mature bull and cutthroat trout were readily caught in many of the tributary streams and in the main stem near the mouths of these tributaries (Montana Department of Fish, Wildlife and Parks 1981). The fall kokanee migration probably lasted six to eight weeks (Graham et al. 1980, McMullin and Graham 1981, Vanek 1972). The cutthroat migration probably lasted from March to June while bull trout probably began their migration during spring runoff and did not complete spawning until fall (Graham et al. 1980c). Lake whitefish were also captured migrating up the Clark Fork during autumn (Vanek 1972). One resident species that probably provided a significant autumn fishery was the mountain whitefish (Gaffney 1956, Malouf 1975).

The species complex in Lake Pend Oreille in 1952 was very similar to that presently in Flathead Lake. The bulk of the fishery in the Flathead River system upstream from Flathead Lake is dependent upon mature cutthroat trout, bull trout, and kokanee salmon migrations out of Flathead Lake and into tributaries during spawning runs or upon immature trout which temporarily rear in tributary streams prior to emigrating to Flathead Lake. Although the "resident" fishery in the Flathead River system may be limited, protracted migrations of cutthroat trout, bull trout, and kokanee at various times of the year simulate a "resident" fishery of significant proportions (Graham et al. 1980c).

Indian historians also referred to the significance of trout migrations in the Clark Fork River. Salish Indians used weirs to catch migrating fish in side streams of the lower Clark Fork such as Graves Creek, Deep Creek, Beaver Creek and others (Malouf 1975). Fish made up as much as 30 percent of the Salish diet with bull and cutthroat trout the most favored (Malouf 1979). The Salish also fished for migratory bull trout near Missoula. In fact, the Salish name for the Missoula, Milltown and Butte area refers to "bull trout" which were caught there (Malouf 1974). Malouf (1974) made the reference that the construction of Thompson Falls Dam blocked the ascent of bull trout up the Clark Fork River. Missoula is 211 river miles upstream from Lake Pend Oreille.

Bull trout in the Flathead River spawn in the upper reaches of the system and return the same year to Flathead Lake often traveling 140 or more miles one way (the maximum length of the Flathead River above Flathead Lake). The bull trout population in the Flathead drainage is almost entirely adfluvial; living in a lake as subadults or adults and migrating into tributaries to spawn (Graham et al. 1980c). The similarity and geographic proximity of the Flathead and Clark Fork River systems would suggest that bull trout were mostly adfluvial in the Clark Fork River system with fish rearing as subadults and adults in Lake Pend Oreille and reproducing in the Clark Fork River system where juvenile fish would rear two to four years before migrating downstream.

Impacts on Fish and Wildlife

Fisheries

The three dams on the lower Clark Fork River blocked access to spawning grounds for fish migrating out of Lake Pend Oreille. The Montana fishery for migratory westslope cutthroat trout, kokanee and bull trout was eliminated by construction of Cabinet Gorge Dam. These migratory fish populations supported a major proportion of the fishery in western Montana.

Thompson Falls Dam was built in 1916 and is a barrier to upstream fish migration from this point upstream (to Milltown Dam). Important tributaries in this reach include; Thompson River, Flathead River, St. Regis River and Bitterroot River. The closure of Cabinet Gorge Dam (11 miles upstream from Lake Pend Oreille) in 1952 totally blocked migrations of fish from Lake Pend Oreille into Montana. Spawning streams for migratory trout in this reach include; Bull River, Prospect Creek, Vermillion River, Graves Creek, Pilgram Creek, Swamp Creek, Elk Creek, Martin Creek, Rock Creek, and Trout Creek (Montana Department of Fish, Wildlife and Parks 1981; Huston 1981a).

Cabinet Gorge Dam eliminated an intensive snag fishery for kokanee in the Clark Fork River by eliminating access to spawning grounds in the Clark Fork River upstream in Montana. Large concentrations of kokanee were evident at Heron Rapids and Thompson Falls where popular snag fisheries had developed (Montana Department of Fish, wildlife and Parks 1981, Vanek 1972). The magnitude of this run can be demonstrated by the fact that an estimated 100,000 kokanee were observed (not an absolute estimate) downstream from Cabinet Gorge Dam soon after closure. Within three years of closure, this run to Cabinet Gorge Dam was only 10 percent of previous years (Jeppson 1953; 1954 and 1960).

Noxon Rapids Reservoir, built in 1959, inundated 36.5 of the remaining 38 miles of free-flowing river between Cabinet Gorge and Thompson Falls Dams. Because Cabinet Gorge Dam was already in place 19 miles downstream, the closure of Noxon Rapids Dam did not impact the migratory fishery from Lake Pend Oreille.

Over 70 miles of river habitat has been impounded by main stem dams on the lower Clark Fork; 34 percent of the river from Missoula downstream and 21 percent of the entire Clark Fork River in Montana. This represents a significant loss of free-flowing habitat.

Fish passage facilities were not installed on any of the Clark Fork dams. Height (208 feet) of Cabinet Gorge Dam, the downstream-most structure, precluded installation of a fish ladder in 1952. Current technology still does not make success (including downstream migration of juvenile fish) of such a structure a preferred option for mitigation.

The lower three Clark Fork reservoirs have been in operation from 22 to 65 years, yet during this expanse of time significant populations of gamefish have not become established. This is true in spite of thousands of man hours and hundreds of thousands of dollars expended in an attempt to establish an acceptable fishery. Management schemes have included a massive rehabilitation and restocking program (Gaffney 1959b; Huston 1967 and 1977).

Localized and seasonal fisheries for whitefish, largemouth bass, and brown trout presently exist in some of these reservoirs. It is difficult to document the overall on-site impact of the reservoirs on the fishery because of the lack of good baseline data. For that reason, the Montana Department of Fish, Wildlife and Parks wrote to a number of fishermen in the area of the Clark Fork reservoirs in the summer of 1981 requesting information on the quality of the fishery prior to and after construction of dams on the river. A large majority responded that the present fishery was poor and lightly fished, and that it had deteriorated from pre-dam conditions.

Wildlife

The habitat types and associated wildlife species affected by these three dams are almost identical. Therefore, to avoid unnecessary repetition, the following discussion will for the most part deal with the three projects collectively.

The three lower Clark Fork projects collectively inundated nearly 21 square miles of land, much of it riparian habitat, along approximately 70 miles of river bottom. This was a major impact on local wildlife habitat and wildlife populations dependent upon them. This impact was almost entirely negative, especially since vacant replacement habitat in the vicinity probably did not exist and the only new habitat created was aquatic. Impacts would be species-specific and the magnitude would depend on the relative population size, distribution, and degree to which those animals required the habitats lost to or created by inundation to complete their life cycle.

These projects pre-date the period when trained wildlife biologists were stationed in the local area; therefore, little documentation regarding the impacts of these projects on wildlife exists. The U.S. Fish and Wildlife Service (1966) quotes an earlier (1950) letter report to the Federal Power Commission which stated that the Cabinet Gorge Project would have little effect on wildlife, and later that the project had had no known significant effect on wildlife resources. These conclusions appeared to be drawn with a minimum amount of documentation. Wildlife losses from the other lower Clark Fork projects seem to have been similarly dismissed.

A letter regarding fisheries values related to the proposed Noxon Rapids Project (Stefanich 1953b) states that some excellent deer areas would be flooded, but to what extent was not known at this time. A later letter (O'Claire 1955) stated that during normal winter conditions, an approximate 10 percent reduction in big game winter range would occur. The significance of this reduction of winter range would be intensified during severe winters. Possible increases in the incidence of train-deer collisions were also addressed, with adjustments such as right-of-way fencing proposed if the problem became serious (O'Claire 1955).

Since little preimpoundment information exists, the magitude of probable impacts on various species would be of a speculative nature, although the direction (whether positive or negative) of the impact is fairly predictable. Therefore, the species impacted and the probable direction of these impacts will be listed with no attempt to quantify actual affects.

The majority of impacts for terrestrial species would have been negative, primarily due to a net loss of habitat. Big game affected would have been principally white-tailed deer, with mule deer, elk and black bear of secondary concern. Effects on other big game species were either minor or of no consequence. For several years after Noxon Dam was completed, deer and elk were lost through thin ice while attempting to cross from one side to the other.

Beaver, muskrat, mink and otter were the principal furbearers affected, with the overall impact being detrimental.

The ruffed grouse was the only upland bird species significantly impacted. Since they depend on vegetation types which include deciduous trees, especially of the genera *Betula* and *Populus* (Johnsgard 1973), and these genera are most prevalent in the riparian vegetation type, habitat losses in this type would impact ruffed grouse negatively.

A wide variety of nongame species were undoubtedly negatively impacted by the flooding of this much habitat. This included small mammals and avian species dependent upon the inundated lands to complete all or part of their life cycle.

Bald eagles winter as far north as open water and food are available, including most of the major rivers of the Columbia River drainage (U.S. Army Corps of Engineers 1979). Impacts of these projects on wintering bald eagles may have been either positive or negative, depending on whether ice-free areas and/or food availability have increased or declined following impoundment.

Waterfowl were affected both negatively and postively, depending on species involved. Negative impacts for all species included loss of old oxbows and backwater slough areas, and post-impoundment water level fluctuations which may either flood nests or expose island nests to mammalian predators when land bridges form at low water levels. These have been offset by creation of additional island nest sites and some goose brood rearing areas when water levels drop in summer.

These reservoirs have provided many species of migrant waterfowl with previously absent staging and/or resting areas. Suitable wintering areas may have changed, depending on availability of food and ice-free areas before and after impoundment.

The net effect of these projects on waterfowl is difficult to determine due to the lack of adequate pre-project baseline data. The projects have probably been beneficial for geese and the potential exists to improve the benefits for ducks if recommendations are adopted.

Mitigation of Project Impacts

Mitigation for impacts on the fishery resource from construction of Cabeint Gorge and Noxon Rapids projects included payment by Washington Water Power Company of $100,000 and $78,000, respectively, to the Montana Department of Fish and Game (Montana Fish and Game Commission 1953, 1958). Washington Water Power Company has continued to provide money and manpower for fish management activities in attempts to establish an acceptable fishery in Cabinet Gorge and Noxon Rapids reservoirs. Little mitigation has been attempted for the loss of fishery resources due to construction of Thompson Falls Dam in 1916.

Management activities in Cabinet Gorge and Noxon Rapids reservoirs and tributaries have attempted to establish a cold water fishery. Management schemes included a massive rehabilitation (poisoning of Thompson Falls Reservoir and the Clark Fork River prior to closure of Noxon Rapids Dam) and restocking program. Species of fish stocked in Cabinet Gorge and/or Noxon reservoirs include: rainbow trout, brown trout, westslope cutthroat trout, yellowstone cutthroat trout, kokanee, coho salmon and burbot (Table 7). Fish were planted as eggs, fry, juveniles and catchables, both in the reservoirs and in tributaries. Tributaries were stocked in an attempt to imprint fish to return to these streams to spawn. Some form of stocking has been ongoing since 1953 (Gaffney 1956, Gaffney 1959, Huston 1967-1980).

Mitigation for loss of wildlife resources has not been attempted.

Thompson Falls Reservoir

Management activities in Thompson Falls Reservoir included the poisoning of rough fish populations in 1958 in an attempt to insure the success of rainbow trout plants in the downstream Noxon Rapids Reservoir (Gaffney 1959b). Approximately 2,000 catchable rainbow trout were planted in Thompson Falls Reservoir in 1965 and one million young kokanee were stocked during the years 1971-1974 (Table 7). Gamefish which have entered the reservoir from upstream areas include largemouth bass, yellow perch, and brown trout. Gamefish populations and fisherman use of this reservoir are apparently minimal (Gaffney 1956; Montana Power Company 1973; Huston 1981a).

Noxon Rapids Reservoir

The Washington Water Power Company funded the Montana Fish and Game Commission to conduct a pre-construction inventory of the project area's fishery resources. Survey results indicated the free-flowing

Table 7. Fish planting records for Thompson Falls, Noxon Rapids and Cabinet Gorge reservoirs and tributaries.

Location	Year(s)	Species	Size	Number
Thompson Falls Reservoir	1965	Rainbow	6-8"	2,000
Thompson Falls Reservoir	1971-1974	Kokanee	fry	250,000 per year
Noxon Rapids Reservoir	1958-1967	Rainbow	2-8"	3,329,467 total
Noxon Rapids Reservoir	1971	Burbot	10-20"	425
Noxon Rapids Reservoir	1971-1972	Rainbow	10"	1,500 per year
Noxon Rapids Reservoir	1972	Kokanee	Fry	400,000
Noxon Rapids Reservoir	1977-1979	Cutthroat (Westslope)	2"	529,863 total
Noxon Rapids Reservoir	1981	Rainbow	5"	160,000
Prospect, Graves, Tuscor and Marten creeks	1961-1962	Rainbow	Eggs	891,000 total
Tuscor and Dry creeks	1962-1963	Brown	Eggs	33,000 total
Prospect Creek Incubation Channel	1966-1969	Brown	Eggs	2,392,000 total
Prospect Creek Incubation Channel	1967-1968	Cutthroat	Eggs	740,000 total
Trout, Swamp, Graves, Prospect Clear creeks	1977-1979	Cutthroat (westslope)	1"	408,171 total
Cabinet Gorge Reservoir	1953-1956	Kokanee	Fry	1,202,816 total
Cabinet Gorge Reservoir	1953-1956	Cutthroat (Yellowstone)	Fry	1,183,952 total
Cabinet Gorge Reservoir	1954	Coho Salmon	Fry	100,224
Cabinet Gorge Reservoir	1959-1961	Rainbow	4-7"	483,174 total
Cabinet Gorge Reservoir	1966-1980	Rainbow	Legals	approx. 2,500 per year

stretch of the Clark Fork River (the Noxon Project area) harbored mountain whitefish as the most abundant game species (Gaffney 1956). Rough fish species (e.g. squawfish, suckers) were found to be dominant in the system by a ratio of nine to one. The study recognized a need for control of rough fish if the impoundment were to provide a productive sport fishery.

An investigation by the Montana Department of Fish and Game into the feasibility of using poisons to remove fish from the project area was completed in 1958. As a result of the study recommendations, the toxicant "rotenone" was used to implement river rehabilitation. The Department considered the kill effective at reducing rough fish populations (Gaffney 1959b). A concurrent kill in the upstream area of the Thompson Falls Reservoir was conducted to slow the reintroduction of rough fish into the project area.

With the reservoir devoid of competing fish, massive stocking of trout was initiated. Two and one-half million fingerling rainbow were released between 1958 and 1960. An additional one million rainbow and brown trout eggs had been planted in the new reservoir's tributary streams by 1962 (Table 7). The cost of this rehabilitation was shared by Washington Water Power Company and the Department.

Sport fishing for rainbow trout was good during years immediately after rehabilitation, however, by 1961 trout populations and angler success steadily declined. Possible reasons for the change in trout populations included a build up of rough fish populations and a change in operation of the Noxon Rapids Project. In 1961, this project was integrated with other northwest hydroelectric projects and resulted in a 30 to 40 foot annual spring drawdown compared to previous drawdowns not in excess of 10 feet (Huston 1965). Subsequent investigations were conducted jointly by the Department and Washington Water Power Company biologists from 1963 through 1965. The study results indicated rainbow trout tended to migrate downstream, out of the reservoir, when spill discharge exceeded 40,000 cubic feet per second (Huston and Vaughn 1968).

From 1965 through 1970, management emphasis shifted to brown trout. This species was believed to be less susceptible to migration during high spring flows. The Washington Water Power Company leased lands near the mouth of Prospect Creek for the construction of incubation channels. Brown trout eggs and fry were planted in the improved stream in substantial numbers. However, the survival and reproduction of this species to sustain a productive sport fishery has never been apparent. The fact that few adult brown trout were captured by fishermen or observed in tributary streams in subsequent years suggest survival is limited or emigration is significant (Huston 1972a).

Also in 1971, a release of 425 burbot was made into the reservoir. This species was considered by the Department to be suitable for "run-of-the-river" impoundment habitat because; 1) burbot are not dependent on an extensive tributary system for reproduction; and 2) they would likely compete with and/or utilize the ever increasing rough fish populations. The introduction of burbot was apparently unsuccessful possibly due to too few fish in the one-time release.

The most recent attempt to establish a productive trout fishery in the Noxon Reservoir began in 1977. Over a period of three years, approximately 1.2 million westslope cutthroat trout fingerlings and fry were released in the Noxon Reservoir and four tributary streams.

The success of this effort is as yet inconclusive; however, annual surveys have not confirmed the presence of these stocked cutthroat trout in any great numbers. Limited manpower precluded tributary surveys in the spring of 1981, the first year adults of these fish would be expected to spawn.

In 1981, the Department released 175,000 rainbow trout into Noxon Reservoir. Drought conditions in eastern Montana preempted release of the four to five inch fingerlings into other Montana waters. These fish are expected to contribute to the impoundment's sport fishery primarily during fall 1981 until spring runoff flows in 1982.

Gamefish comprised approximately one percent of the fish captured in gill nets in Noxon Rapids Reservoir in 1980. Northern pike, although never stocked, were first collected in Noxon Rapids Reservoir in 1972 (Huston 1973b). This species is still uncommon in the reservoir. Yellow perch have been present for an even greater period of time and, although it is relatively common, the small size of most fish discourage its use. Largemouth bass are also present in the reservoir but are not abundant. The fact that these species have been present for an extended period of time yet have not developed a fishery indicates that factors exist which limit the establishment of a warm water fishery.

The Department has been maintaining an annual, general survey of the reservoir area since 1955. These surveys have often been conducted with assistance from Company biologists. Much of the information has been reported by the Department in annual Job Progress Reports (Huston 1967-1980).

Cabinet Gorge Reservoir

From 1952 (the year Cabinet Gorge Reservoir was closed) to 1955, nearly one million yellowstone cutthroat and one million kokanee fry were planted in Cabinet Gorge Reservoir (Table 7). Despite these introductions these species made up less than one percent of fish taken in gill nets in 1955 (Gaffney 1956). From 1952 to 1961, 1,200,000 kokanee, 100,000 coho salmon, and 2,400,000 cutthroat fry were planted in Cabinet Gorge Reservoir. During this time period, 483,000 rainbow trout were planted which were four to seven inches long.

During 1966 to 1980, 37,500 "legal" size rainbow trout were planted in Bull River Bay of Cabinet Gorge Reservoir (Table 7). In addition, from 1958 to 1981, numerous introductions of various species were made in Noxon Rapids Reservoir, many of which ended up in Cabinet Gorge Reservoir (Huston and Vaughn 1968). To date, the bulk of the cold water gamefish population in Cabinet Gorge Reservoir is made up of mountain and lake whitefish and brown trout. Gamefish comprised approximately five percent of the gill net catch in June of 1980 (Huston 1980).

Northern pike, although in the drainage for at least the last 10 years, are rare in the reservoir. Yellow perch are common but their small size discourages fishermen use. Largemouth bass are locally common and support an unquantified fishery.

Brown trout, whitefish, and largemouth bass are species difficult to catch or require special fishing techniques. Because these species comprise the bulk of the gamefish population in Cabinet Gorge Reservoir, the problem of providing an acceptable fishery is compounded.

Poor Productivity

Perhaps the main reason a quality fishery has not developed on the Clark Fork reservoirs is that all are basically "run-of-the-river" impoundments. At the mean rate of inflow, water exchange occurs approximately once every 11.6 days in Noxon Rapids, 2.4 days in Cabinet Gorge and every nine hours in Thompson Falls reservoirs. These rates are influenced by rates of inflow and reservoir storage capacity. Plankton densities are low (Huston 1977) probably because nutrient levels never build up in the reservoirs and water current washes plankton downstream. Brook and Woodward (1956) noted that retention time in small lakes must exceed 18 days to get zooplankton development. Johnson (1964) observed that zooplankton crops declined at an accelerated pace if the flushing time was less than 15 days.

Fluctuating water levels and much of the reservoir topography also prevent the establishment of a littoral zone. The littoral zone is the portion of a body of water extending from the shoreline lakeward to the limit of rooted plants. Great diversity for plant and animal species and high annual production characterize the littoral zone (Cole 1975; Reid 1961). Thus, the two major food producing areas normally found in a lake, the littoral and limnetic (open surface water areas which produce plankton) zones are severely restricted by present habitat conditions in the lower Clark Fork reservoirs.

The flowing water in the reservoir resembles river habitat; however, environmental conditions in the reservoirs restrict production of benthos normally found in rivers. Benthic populations are extremely low because riffle habitats are flooded and reservoir water levels fluctuate (Huston 1977).

Without good numbers of zooplanktors and/or benthic organisms, a necessary link in the food chain for fish is weakened. The vast majority of salmonids planted in these reservoirs did not survive, or moved downstream through these slow moving impoundments.

Unsuitable Water Temperature

Maximum water temperatures in these impoundments (surface temperatures up to 74° F with little thermal stratification) may limit salmonid production. Warm water species such as yellow perch, northern pike, and largemouth bass are only locally common and populations are dominated by small individuals, probably indicative of poor productivity and relatively cool (for these species) water temperatures.

Water Level Fluctuations

Thompson Falls Dam is a run-of-the-river structure, but because of design features, drawdown during spring has been as great as 16 feet (Montana Power Company 1973). Cabinet Gorge Reservoir fluctuated three feet daily and 14 feet weekly prior to construction of Noxon Reservoir 20 miles upstream. From 1961 to present, operations of Noxon Dam has reduced daily and weekly fluctuations in Cabinet Gorge to three and five feet, respectively. Since 1961, water levels have fluctuated less in Cabinet Gorge Reservoir than in Thompson Falls or Noxon (Huston 1965). Cabinet Gorge also has the best gamefish population of the three reservoirs (Huston 1980, 1981b). Noxon Reservoir is used for peaking power and had a maximum spring drawdown of 40 to 60 feet during 1961 to 1970 (Huston 1965) while since that time, maximum drawdown has been 36 feet (Woodworth 1981).

Water level fluctuations in the lower three Clark Fork Reservoirs may be detrimental to fish populations which spawn along shorelines. Near maximum winter drawdown in Noxon Reservoir can block spawning fish from ascending Marten Creek and Vermillion River during spring (Woodworth 1981). Inadequate flows in the south channel downstream from Thompson Falls Dam may prevent fish from ascending Prospect Creek (Huston 1981a). Fluctuating water levels reduce densities of benthic organisms (Huston 1977, 1981b) and prevent establishment of a littoral zone (at least in localized areas of the reservoirs) which can be a productive food producing area.

Squawfish, peamouth, largescale suckers, longnose suckers and small yellow perch dominate the fish population in the lower three Clark Fork reservoirs. From 1955 to 1962, after extensive rehabilitation and fish stocking, gamefish comprised 25 percent of the fish populations in Noxon and Cabinet Gorge Reservoirs. Of 2,200 and 1,100 fish netted in Noxon Reservoir in 1976 and 1979, less than two and five percent, respectively, were gamefish (Huston 1981b). The slow moving river-like reservoirs have created habitats in which undesirable species have established relatively large populations compared to gamefish populations. These undesirable species are much more numerous than gamefish and discourage fisherman use by taking bait intended for gamefish.

Water Quality

All three lower Clark Fork River reservoirs add to gas saturation levels. This is especially likely to occur during the spring high water period when water has been spilled. On May 13, 1974, gas saturation levels at the reservoir surface ranged from 102 percent at Thompson Falls forebay to 136 percent at Cabinet Gorge forebay (Huston 1975b).

Severe gas supersaturation can cause direct mortality of fish. Thorn et al. (1978) observed that trout (lake, brook, rainbow and brown) mortality began when saturation levels generally reached 120 to 125 percent. One hundred percent mortality occurred when saturations were 130 and 144 percent depending on the species. Cause of death was attributed to massive air emboli in major blood vessels and the heart. Sublethal effects included lowered growth rate, decreased resistance to diseases, and eye damage.

Because of the effect of pressure on the solubility of gas in water, supersaturated conditions at the reservoir surface are not the same at greater depths. For example, 130 percent gas supersaturation at the water surface will be at equilibrium at a depth of 10 feet (Leman 1971). Fish and aquatic life inhabiting the upper water levels of Noxon Rapids and Cabinet Gorge reservoirs, particularly during the high water period would have to descend to deeper water to survive.

Heavy metal and other pollution problems in the upper drainage may also be impacting the aquatic ecosystem in the lower drainage.

Management Goals and Objectives

Fisheries

Fish management goals for the Thompson Falls, Noxon Rapids and Cabinet Gorge projects on the lower Clark Fork River include:

1. Establish an acceptable, self-sustaining recreational fishery in the lower Clark Fork reservoirs as partial mitigation for fishery losses due to construction of the aforementioned dams.

2. Enhance or protect stream fisheries in the Clark Fork drainage necessary to maintain fishing opportunity in and around the Clark Fork reservoirs as partial mitigation for fishery losses due to construction of the dams.

3. Enhance or protect other valuable or potentially valuable fisheries in the Clark Fork drainage as mitigation for losses of migratory fishes to the upper basin due to impoundment of the Clark Fork River.

Wildlife

To protect, maintain and enhance the available supply of wildlife and their habitats in the vicinity of these projects in order to meet the demand for wildlife-oriented recreational pursuits as mitigation for project-related wildlife losses.

Recommendations to Protect, Mitigate and Enhance Fish and Wildlife Resources

Fisheries

On-site

1. To establish a significant fishery in the lower Clark Fork River reservoirs, management activities must increase fish survival, reproductive success, and production. It is recommended that a study be initiated to: 1) assess the existing habitat suitability for species now present and those designated for possible introductions (this would include assessment of spawning, rearing, food, and cover habitats and hydrological, limnological, and water quality conditions); and 2) determine the most feasible methods to improve habitat suitability or increase habitat availability for desirable species considering particular species needs, project operations, costs and other constraints (1.7.1).

The poor gamefish production in the lower Clark Fork reservoirs is typical of other run-of-the-river reservoirs in Montana. Fish management measures to date have not produced a satisfactory fishery. For this reason, it is necessary to review past fish management practices, reservoir operations as it affects fish habitat, and life history and habitat requirements of game species stocked in the past and those considered for future introductions. Limnological conditions and fish populations in Thompson Falls, Noxon Rapids and Cabinet Gorge reservoirs must be quantified and compared to habitat conditions and project operations of each reservoir to determine the reason for poor fish production and develop ways to improve it. The requirements of fish species stocked in the past and those considered as future introductions should be correlated to rearing habitat, food production, water quality parameters, and project operations in each of the three reservoirs. If significant deficiencies exist in water quality or habitat in any of the three reservoirs, remedies should be found before further stocking takes place.

Specific study objectives include:

1. Determine if food production is adequate to allow survival and growth of gamefish in the lower Clark Fork reservoirs and investigate ways to improve it (if necessary). Methods to increase food production may include stabilizing water levels along the shoreline to encourage establishment of a littoral zone, providing artificial substrate to increase insect production, or other techniques.

2. Identify areas and determine water levels necessary to provide rearing and spawning habitat for selected game species. A survey to compare shoreline topography, water level flux, and potential littoral development in these reservoirs is appropriate.

3. Determine the potential of Marten Creek and Vermillion River as spawning streams and (if appropriate) provide access to spring spawning fish by maintaining water levels in Noxon Rapids Reservoir, constructing an access channel, or other methods.

To accomplish the fish management goals for the lower Clark Fork reservoirs, habitat conditions must be provided so selected fish species can survive, grow and reproduce to provide a suitable self-sustaining fishery. A self-sustaining recreational fishery is more desirable than long-term hatchery plants because: 1) the natural offspring are from parents which have adapted to present habitat conditions; and 2) the long-term costs of raising and planting fish in sufficient numbers can be prohibitive.

The four species of fish which dominate the gamefish population in the lower Clark Fork reservoirs include lake whitefish, mountain whitefish, brown trout and largemouth bass. Although the size of these populations is unquantified, each appears to be self-sustaining.

Lake whitefish and largemouth bass reproduce in reservoirs and lakes. Once spawning areas on the Clark Fork reservoirs are located, the habitat can be assessed to determine the effect of project operations and other variables on reproductive success. The information will allow inadequacies in spawning habitat to be determined and corrected prior to management of designated species.

Long-term dewatering of spawning areas can reduce reproductive success of fish by exposing fish eggs or making spawning areas unavailable to gravid fish. Water levels must be stable or increasing during spawning period of gamefish and not decline to expose fish embryos for long periods of time during the incubation period. By identifying critical reproductive periods and existing or potential spawning areas, suitable water levels can be determined and implemented as practicable. Investigations will be necessary to determine the best method to maintain water levels at spawning grounds. Water levels can be maintained by changing project operations or by other methods such as constructing dikes around spawning areas.

Declining or low water levels in Noxon Rapids Reservoir can inhibit access to spawning grounds in Marten Creek and Vermillion River. Since Noxon Rapids Reservoir reaches complete drawdown in late winter, the greatest blockage is for spring spawning fish. The potential of these two tributaries as spawning grounds for spring spawning fish should be determined and measures to provide access implemented if findings warrant.

It should be determined if these passage problems were a result of operation of Noxon Rapids Dam or were historical problems. This would be necessary to determine if proposed mitigation measures would be classified as on-site enhancement measures or mitigation for operation.

4. Determine the importance of the tailwater below Thompson Falls Reservoir for spawning and rearing of lake and mountain whitefish, brown trout and other fish, and quantify and maintain necessary flows and spawning habitat.

Little is known concerning the importance of the 1.5 miles of river habitat below Thompson Falls Dam. This is the only remaining river habitat in the lower 80 miles of the Clark Fork River in Montana and may have potential as a spawning area for lake and mountain whitefish, brown trout and other salmonids. Potential problems which must be addressed include scouring of suitable-sized gravel and maintenance of favorable spawning flows.

Flows in the south channel below Thompson Falls Dam may be inadequate to attract fish upstream to Prospect Creek, a potentially important spawning tributary. Proposed additions to Thompson Falls generation facilities could compound this problem by diverting a larger portion of the river, for a longer period of time, through the powerhouse (which returns to the north channel downstream from the mouth of Prospect Creek). Adequate attractant and passage flows should be determined and operational recommendations made to the Council and appropriate agencies.

The tailwater fishery below Thompson Falls Dam is one of the most successful of the lower Clark Fork reservoirs and may be important rearing habitat for salmonids. Necessary instream flows should be determined and operational recommendations made to the Council and appropriate agencies.

5. Delineate important spawning tributaries and determine and implement (if appropriate) measures to increase reproductive success of reservoir gamefish in the lower Clark Fork drainage.

Fish which reside in the Clark Fork reservoirs and reproduce in tributary streams include brown, cutthroat, bull and rainbow trout as well as mountain whitefish. Spawning locations and possible improvements for passage and reproduction should be determined. Potential factors which may limit reproductive success may include adequate flows for passage and spawning, suitable spawning substrate, proper channel and hydraulic characteristics, adequate streambank cover, and adequate water quality. Enhancement of tributaries to improve spawning success could help offset lack of reproduction in the reservoirs. The feasibility of implementing enhancement measures, at areas where reproductive success could be improved, should be determined and appropriate actions taken.

6. Determine if water quality in the lower Clark Fork reservoirs is adequate for survival, growth and reproduction of desirable fish species.

The effect of pollution in the upper Clark Fork River on the survival, growth and reproduction of fish and fish-food organisms in the lower Clark Fork reservoirs in unknown. Water temperature (surface maximum 74° F) and total gas supersaturation (surface maximum 136 percent) may also be limiting survival and growth of certain species. Analysis of water quality should be done on the lower Clark Fork reservoirs to determine if this factor is limiting gamefish production. Water quality parameters should be correlated to requirements of specific fish species to determine if water quality has prevented or will prevent establishment of selected game species.

Off-site

The impacts of hydroelectric projects often reach far beyond the immediate dam and reservoir location. This is particularly true with migratory fish species such as the westslope cutthroat trout, bull trout and kokanee salmon. As mentioned in preceding sections of this document, a fishery based on these species has been progressively reduced by the closures of three of the four mainstem Clark Fork dams in Montana (Noxon Rapids excluded). In this perspective, the following off-site enhancement and protection measures should be viewed as project mitigation for losses which were not previously mitigated.

1. Compensation for loss of a significant river fishery in the lower Clark Fork drainage should include enhancement of the Bitterroot River fisheries by purchasing rights to 15,000 acre-feet of water out of Painted Rocks Reservoir from existing willing sellers for the purpose of providing instream flows during the summer and fall (1.8.2).

The lower Clark Fork River reservoirs have blocked a significant migration of fish out of Lake Pend Oreille and eliminated the fishery in Montana dependent on these migrations. The reservoirs have also inundated 80 continuous miles of river habitat. To compensate for loss of a stream fishery, which is becoming less abundant and more valuable throughout the country, protective and enhancement measures for remaining stream habitat in the Clark Fork drainage would be viewed as a form of partial mitigation for these losses.

Agriculture is one of the primary industries in the valley and the Bitterroot River is the lifeblood of that industry. The irrigation season runs from June through September with the heaviest irrigation demands on the river coming in July, August and early September. During this time of year, it is common for the river to be nearly dry except for the deep pools on about 12 miles of the river from Corvallis to Bell Crossing. A number of large diversions are able to take all except the intragravel flow.

Irrigation returns begin to recharge the river about two miles below Bell Crossing. At the Stevensville bridge, about six miles downstream from Bell Crossing, most of the remaining irrigation water returns to the river. The dewatering not only affects fish and other aquatic organisms, but it also adversely affects irrigation efficiency on the mid-section of the river.

To alleviate these problems, Painted Rocks Dam was built in 1938 by the former Montana State Water Conservation Board using funds from the Public Works Administration. The reservoir has a maximum capacity of 32,362 acre-feet. There is normally enough stream flow each spring to fill the reservoir five times.

Water sales from the reservoir are made by means of contracts with the Department of Natural Resources and Conservation. A contract for 5,000 acre-feet is held in perpetuity by the Ravalli Fish and Wildlife Association, Western Montana Fish and Game Association and the Department of Fish, Wildlife and Parks. Approximately 1,500 acre-feet are sold each year to the Dailey Ditches. Sales from the nearly 26,000 acre-feet of the remaining water are seldom made. In 1980, the Department of Natural Resources and Conservation established an operational policy for Painted Rocks Reservoir. This policy makes water available for local use on a short-term basis. It also makes sales on a long-term basis possible, but long-term sales are made only after public review (Montana Department of Natural Resources and Conservation 1980).

Contracts for water make provisions for amounts of water, delivery points and timing of delivery. Where instream flows are concerned, contractual arrangements alone have not insured delivery of water where it has been needed most. This water is normally taken into the irrigation ditches. There is seldom enough water to satisfy both irrigation and instream needs and there is no water commissioner on the river to oversee ditch operation.

Additional water is needed for instream use to alleviate the severe dewatering problem. We estimate that 15,000 acre-feet of water is required to provide sufficient flow for fish during the six weeks of peak irrigation withdrawal. Water rights are presently available from willing sellers, but no money is available to secure them. A water commissioner may also be needed to insure proper ditch operation and delivery of the instream flows through the dewatered area.

2. Compensation for loss of a significant migratory fishery in the Clark Fork drainage should include protection and maintenance of the Big Blackfoot River, Rock Creek and Fish Creek, and possibly other Class I streams in a natural and unaltered condition (1.9.2).

These three streams are Class I streams as determined by a complex and standard Montana stream classification system (see Appendix C). They have the highest stream fishery resource value in that area because they are heavily fished and contain high quality trout habitat. These resources cannot be replaced, nor could loss of these resources be adequately mitigated.

Protection of these remaining resources could be viewed as a form of partial mitigation for loss of fishery resources in the Clark Fork River resulting from the construction of existing hydroelectric projects.

Wildlife

The following recommendations are concerned with present project operations. Any proposed or possible future changes in operation of these projects would have to be addressed at that time, and possibly new recommendations developed.

On-site

Waterfowl nesting success, especially for geese, could be enhanced in several ways. For example, maintaining water level at or near full pool during the peak season (early March through early to mid-April) would be beneficial. However, such stability may be difficult to achieve because of uncontrollable spring runoff flows. Alternative enhancement measures could include providing artificial nesting structures (either elevated or floating), building up present islands that are normally flooded at high pool so that they are above this level, and/or constructing new island nesting sites.

Because these projects are all basically "run-of-the-river", maintaining stable water levels during the peak of goose nesting might be difficult since it also corresponds with normal spring runoff.

Wood duck nest boxes could provide nesting habitat, assuming other habitat values are suitable for their existence. This should be determined prior to erecting any nesting structures.

Any islands raised or newly constructed should be protected in some manner (rip-rap, log booms, etc.) to prevent erosion and prolong their life.

Selected options involving construction should also be scheduled for regular maintenance and repairs.

Several measures could be used to increase on-site wildlife habitat and/or use of the area. Food and cover plantings could be made using a plant species suited to the growing conditions and the wildlife species involved. Goose brood rearing areas (especially if these are limiting production) could be established and located as near as practicable to nesting concentrations. Ditching (Mathiak 1953) and/or pothole blasting (Mathiak 1965) in marshy areas having dense cover but little open water would increase the depth and amount of open water. This can benefit many species of waterfowl, furbearers and other forms of wildlife.

The creation of permanent shallow water ponds by constructing dikes that would retain water during drawdowns or that would trap water from springs or small streams entering the reservoirs would benefit waterfowl and other forms of wildlife as well. Islands could be built within ponds at the time of dike construction. Stabilization of water levels and permanence of water in these ponds would probably allow establishment of emergence and submerged aquatic vegetation as well as willows, cottonwoods, etc. along the shorelines. This would benefit a wide variety of wildlife, especially aquatic furbearers and nongame birds.

Off-site

Opportunities for on-site improvement of wildlife values on existing projects are limited to project waters and generally narrow land boundaries. As an alternative to on-site activities and/or to further improve the wildlife values in the project vicinity, off-site enhancement of a designated species, or groups of species, as compensation for previously unmitigated wildlife losses may be necessary.

See off-site recommendations for Hungry Horse project.

KOOTENAI RIVER BASIN

BASIN DESCRIPTION

Geography

The Kootenai River flows in a southwesterly loop from the west slope of the continental divide near Banff, British Columbia through northwestern Montana, northern Idaho and back into British Columbia (Figure 4). Several interesting geologic features are found in the basin. The Kootenay (Canadian spelling) flows through the Rocky Mountain Trench where the river passes within 1.5 miles of Columbia Lake, source of the Columbia River. Kootenai Falls, the largest remaining water fall in Montana not impounded by a dam is located between Libby and Troy, Montana (Graham 1979). Near Bonners Ferry, Idaho, the Kootenai enters the Purcell Trench where its gradient is so low that the river level at Bonners Ferry is affected by water levels in Kootenai Lake (approximately 50 miles downstream; Bonde and Bush 1975).

Most of the Kootenai drainage is mountainous. Elevations range from approximately 1,370 feet at the mouth to 11,870 feet in the north-eastern portion of the drainage. Approximately 88 percent of the drainage is forest covered.

Libby Dam, located 17 miles upstream of Libby, Montana, impounds 92 miles of the river in Montana and British Columbia. Two proposed dams would be located in Montana. The Libby Reregulating Dam would be located 10 miles downstream of Libby Dam and would impound all of the river between the two dams (U.S. Army Corps of Engineers 1974). Kootenai Falls Dam would be located immediately above Kootenai Falls and would impound 3.5 - 4.5 miles of the Kootenai River. Lake Creek, a tributary of the Kootenai near Troy, Montana, is impounded by a low-head dam near its mouth. It is felt that the present Lake Creek Project has had little impact on the Kootenai River or its fish and wildlife populations (Montana Light and Power Company, 1980).

Hydrology

The Kootenai River drains approximately 19,300 miles^2 of which approximately 4,900 miles^2 is in the United States. It is the second largest tributary of the Columbia River, surpassed only by the Snake River. Mean annual discharge measured at Libby, Montana, between 1911 and 1971 was 12,070 cfs. Historic extreme discharges range from a minimum of 895 cfs to a maximum of 121,000 cfs. Gradient of the river averages 5.3 feet/mile over most of its 485 mile length. Gradient varies, however, from near zero between Bonners Ferry and Kootenay Lake to 29.7 feet/mile in the area of Kootenai Falls.

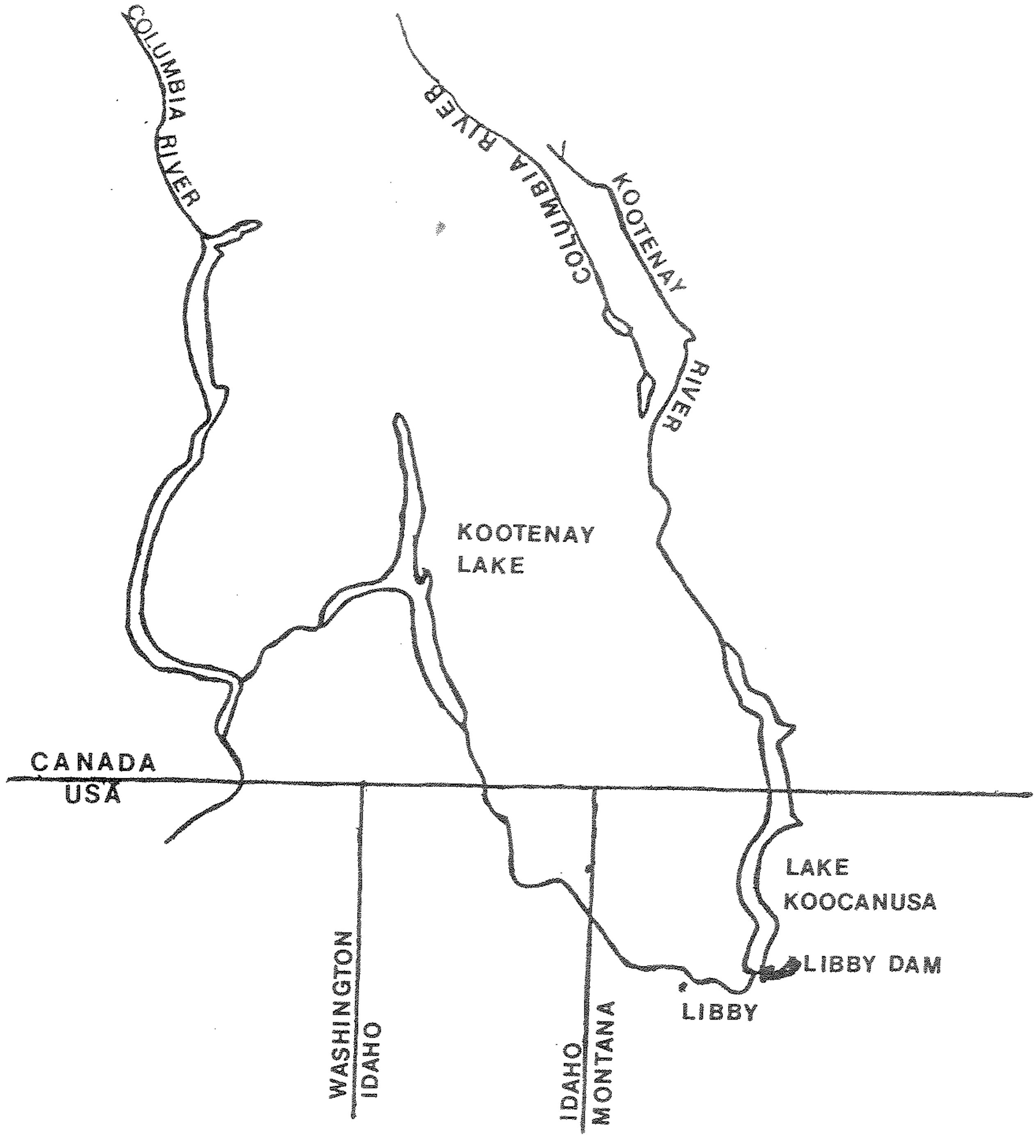

Figure 4. Map of Kootenai River drainage.

Climate of the Kootenai basin is typical of mountainous river basins in the Inland Pacific Northwest. Precipitation averages 30 inches per year. Approximately 70 percent of the total precipitation falls as snow. Mean temperatures range from 67° F in July to 22° F in January at Libby.

Prior to construction of Libby Dam, discharge patterns reflected the basin's climate. Peak flows occurred in May or June with snow melt runoff. Minimum flows generally occurred in mid-winter. Operation of Libby Dam for flood control and hydroelectric energy production drastically altered discharge patterns. Since impoundment, minimum flows downstream of Libby Dam have occurred in April and May when the reservoir was filling. Peak monthly flows occurred from November through January when the reservoir was drafted for flood control (Graham 1979).

Water quality in the Kootenai below Libby Dam has also been altered since impoundment. Supersaturation levels of dissolved gases were common until turbine installation was completed in 1975 (May and Huston 1979). May and Huston (1979) also noted increased algal production due to warmer winter water temperatures, reduced turbidity, and lack of scouring spring flows. Impacts on water temperatures in the river have been diminished by installation of a selective withdrawal system in Libby Dam; however, significant changes have occurred since impoundment. Spring and summer water temperatures are cooler than historic temperatures while fall and winter temperatures are warmer (May and Huston 1979). Ice cover in calm water areas of the river that was common in winter prior to impoundment has not formed since impoundment. The reservoir acts as a nutrient trap, reducing nutrient levels in the Kootenai downstream of Libby Dam (May et al. 1980). Significant reductions in the concentrations of some ions (NH_3, F, PO_4, $CaSO_4$) were not related to impoundment but occurred as a result of a pollution abatement program at a fertilizer plant located on the St. Mary River, British Columbia (Bonde and Bush 1975, Graham 1979, May and Huston 1979).

Lake Koocanusa (the reservoir behind Libby Dam) is a long, narrow reservoir extending upstream to just above Wardner, British Columbia. The reservoir has a storage capacity of 5,809,000 af. Mean depth varies from 125 feet at full pool elevation (2,459 feet) to 60 feet at minimum regulated pool (2,287 feet). Drawdown of the reservoir to minimum regulated pool reduces its volume by 85 percent (May et al. 1979). Operation of Libby Dam usually results in minimum pool elevation in April and maximum pool elevation from July through September.

Lake Koocanusa was expected to exhibit eutrophic behavior due to nutrient loading from the Canadian portion of the Kootenai River (Bonde and Bush 1975). Blooms of *Aphanizomenon flos-aquae*, a blue-green algae characteristic of eutrophic waters, occurred in 1974 and 1975, but a combination of factors has resulted in water quality parameters well within the oligotrophic range. Sediment inflow, weak thermal structure and short retention time (0.67 years) have limited productivity of the reservoir (Woods and Falter 1980).

Operation of Libby Dam could be altered significantly after 1984 if Canadian authorities exercise their right to divert up to 1,500,000 af of water from the Kootenai River to the Columbia River at Canal Flats. The diversion was authorized in a 1964 bilateral treaty. The treaty authorized additional diversion after the years 2024 and 2064. If the diversions are exercised, Canada could divert all water in the Kootenai River above the flows of 2,500 cfs and 1,000 cfs, respectively. If the full potential of the diversions is realized, energy potential of the Kootenai River dams will be limited.

Fishing Use

Graham (1979) estimated 5,705 man-days of fishing pressure were expended in the 3.5 mile stretch immediately above Kootenai Falls in 1978. Expanding Graham's findings to all of the Kootenai River in Montana results in an estimate of approximately 80,000 man-days of fishing pressure. Fishing pressure is probably slightly higher in the Kootenai Falls section than in other sections of the river, but total pressure is probably in the magnitude of 50,000 man-days per year. The Kootenai River fishery easily ranks in the top ten among Montana waters.

No direct creel census of Lake Koocanusa has been attempted. A Montana Department of Fish, Wildlife and Parks mail survey in 1975-1976 estimated 18,568 man-days of fishing pressure on Lake Koocanusa. That figure is probably a low estimate, as evidenced by the estimate of 20,893 man-days for the Kootenai River in the same survey.

Access to Lake Koocanusa was limited in the immediate post-impoundment years but has improved in recent years.

Fish and Wildlife Resources

The Kootenai River is one of the most productive trout streams in Montana (May and Huston 1979). Rainbow trout is the principal gamefish. Anglers also harvest small numbers of westslope cutthroat trout and mountain whitefish (Graham 1979; May and Huston 1979). The entire Montana portion of the Kootenai River is classified as a highest value fishery resource by the State of Montana and the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 1981). A list of species found in the Kootenai River above and below Kootenai Falls is presented in Table 8.

Two species of special concern are found in the Kootenai River below Kootenai Falls. White sturgeon, classified as rare and endangered by AFS in Montana, are found in limited numbers (Graham 1981b). Populations of native rainbow trout have been found in Callahan Creek and the Yaak River (Allendorf et al. 1978; Espeland and Scow 1978).

Table 8. Relative abundance of fish species in the Kootenai River upstream and downstream of Kootenai Falls (Graham 1979).

Common name	Scientific name	Relative abundance*	
		Upstream	Downstream
Westslope cutthroat trout	*Salmo clarki lewisi*	U	U
Rainbow trout	*Salmo gairdneri*	A	A
Bull trout	*Salvelinus confluentus*	U	U
Brook trout	*Salvelinus fontinalis*	U	U
Mountain whitefish	*Prosopium williamsoni*	A	A
White sturgeon	*Acipenser transmontanus*	N	U
Burbot	*Lota lota*	U	U
Kokanee	*Oncorhynchus nerka*	N	U
Torrent sculpin	*Cottus rhotheus*	U	U
Slimy sculpin	*Cottus cognatus*	R	R
Largescale sucker	*Catostomus macrocheilus*	A	A
Longnose sucker	*Catostomus catostomus*	U	U
Northern squawfish	*Ptychocheilus oregonensis*	R	U
Peamouth	*Mylocheilus caurinus*	R	A
Redisde shiner	*Richardsonius balteatus*	U	R
Longnose dace	*Rhinicthys cataractae*	A	A

*A = abundant, U = uncommon, R = rare, N = not reported.

Rainbow trout and westslope cutthroat trout are the most important gamefish in Lake Koocanusa (McMullin 1979). The spring and fall fishery is rated as good to excellent for trout reservoirs (May et al. 1979). A winter and spring fishery for burbot is gaining popularity (May and Huston 1980). A list of fish species found in Lake Koocanusa and their relative abundance is listed in Table 9.

For description of wildlife species present, see section in Description of Flathead River Basin.

Table 9. Relative abundance of fish species in Lake Koocanusa (May et al. 1979, McMullin 1979).

Common name	Scientific name	Relative abundance*
Westslope cutthroat trout	*Salmo clarki lewisi*	A
Rainbow trout	*Salmo gairdneri*	A
Bull trout	*Salvelinus confluentus*	A
Brook trout	*Salvelinus fontinalis*	R
Lake trout	*Salvelinus namaycush*	R
Mountain whitefish	*Prosopium williamsoni*	A
Burbot	*Lota lota*	U
Kokanee	*Oncorhynchus nerka*	R
White sturgeon	*Acipenser transmontanus*	R
Largemouth bass	*Micropterus salmoides*	R
Pumpkinseed	*Lepomis gibbosus*	R
Largescale sucker	*Catostomus macrocheilus*	A
Longnose sucker	*Catostomus catostomus*	U
Northern squawfish	*Ptychocheilus oregonensis*	A
Peamouth	*Mylocheilus caurinus*	A
Redside shiner	*Richardsonius balteatus*	A

* A = abundant, U = uncommon, R = rare.

LIBBY DAM PROJECT

Project Description

Libby Dam is a main stem, high-head project located on the Kootenai River, approximately 17 miles upstream of Libby, Montana. Construction began in 1966 and was completed in 1973. Reservoir impoundment began in 1972. Full pool was reached in 1974. Powerhouse operations began in 1975.

The concrete gravity dam stands 420 feet above bedrock with a crest length of 2,900 feet. Four generators have a hydraulic capacity of 23,000 cfs and can produce up to 420 MW of electrical energy. Fifteen downstream power plants (five in Canada) benefit from Libby Dam releases. A total of eight turbine bays were built in the powerhouse, but it is uncertain whether all will be utilized. Pending congressional legislation may limit construction to a total of five generators.

The reservoir created by Libby Dam, called Lake Koocanusa, is 90 miles long at full pool. The upper 42 miles are located in British Columbia. The reservoir stores 5,869,000 acre-feet of water. Active storage is 4,979,000 acre-feet. Potential maximum drawdown of 172 feet alters morphometric characteristics of the reservoir significantly. Surface area is reduced from 46,500 acres at full pool to 14,600 acres at minimum pool (at minimum pool the entire reservoir is within the United States). Mean depth is reduced from 125 feet to 60 feet and maximum depth from 351 to 179 feet at full and minimum pool, respectively. Storage ratio of the project is 0.67 years.

Project Operation

Libby is one of four major storage projects in the United States portion of the Columbia basin, along with Hungry Horse, Dvorshak, and Grand Coulee. Flood control operation results in low flows in the Kootenai River during spring and high flows in fall and winter. Both peak and baseload electrical energy are produced subject to several constraints. Minimum flow of the Kootenai River below Libby Dam is maintained at 4,000 cfs whenever possible and 3,000 cfs if reservoir refill is in doubt. In emergency situations, a 2,000 cfs minimum is allowed. Vertical water level fluctuations in the river are restricted to one foot per hour and four feet per day during the summer season (May 1 - September 30). During the winter season (October 1 - April 30), fluctuations of two feet per hour and six feet per day are allowed. Impact on the aquatic environment of an increased rate in reduction in flow from high discharges down to 8,000 cfs is being evaluated and may be adopted as a normal operating procedure. Flows of 4,000 cfs to 8,000 cfs are provided as much as possible on weekends and holidays to enhance fishing opportunity. The selective withdrawal system is operated as described by May et al. (1979).

History of Fish and Wildlife Resources

Little quantitative data is available on the fish population and fishery in the Kootenai River prior to construction of Libby Dam. A revision of a 1965 Fishery Analysis (Huston 1974) characterized the fishery as follows.

The most abundant gamefish species found in Kootenai River in Montana was the mountain whitefish. Westslope cutthroat, rainbow trout and Dolly Varden were common and suckers were abundant. Peamouth and squawfish were rarely found above Kootenai Falls, but were abundant below Kootenai Falls. Burbot were found throughout the river system but were probably most abundant below the Town of Libby, Montana. Sturgeon were found only below Kootenai Falls. Kokanee migrated up the Kootenai River and spawned in several tributaries below Kootenai Falls. Fishes found in mainstem Kootenai River reproduced in the river itself or in tributary streams.

The majority of mountain whitefish spawned in the Kootenai River mainstem. In-river spawning areas that existed within the Libby Dam impoundment area were not known. In-river spawning areas for the Kootenai River downstream to Kootenai Falls, a distance of about 35 miles, appeared to be primarily concentrated within the first 11 miles of the river below Libby damsite. Mountain whitefish utilizing tributary streams for spawning may have moved considerable distances to reach these streams. It was known that some whitefish had moved downstream from near Warland through Libby damsite to spawn in Fisher River. Upstream movement of whitefish from below Libby, Montana to Fisher River had also been documented.

Pre-impoundment surveys revealed a small trout population in the Kootenai River below Rexford, Montana (Huston 1971c, 1972b). Trout fishing below Rainy Creek (near Libby) was extremely poor due to pollution from a mine operation. Burbot fishing was popular and productive in the 1940's and 1950's. Burbot populations declined to near extinction in Montana, however, due to pollution (May and Huston 1979). This decline appeared to coincide with a decline in the white sturgeon population and may be related to water pollution (Graham 1981b).

Impacts on Fish and Wildlife

Fisheries

Libby Dam impounded one-half of the free-flowing Kootenai River in Montana and 42 miles of the river in British Columbia. Storage for flood control modified normal stream flows. Historically, the Kootenai near Libby peaked at an average flow of 67,500 cfs in spring. Minimum flows of approximately 1,600 cfs were reached in fall and winter. Since the dam was built, peak flows of approximately 20,000 cfs have occurred during the fall and winter reservoir drafting period. Low flows of approximately 3,000 cfs have occurred during spring.

Several physical and chemical characteristics of the river have been altered since Libby Dam was constructed. Lack of flushing flows in spring has resulted in build-up of deltas around the mouths of tributary streams. Suspended sediment levels have decreased greatly. Fall and winter water temperatures are warmer and spring and summer temperatures are cooler than they were prior to the dam. Operation of a selective water withdrawal system in Libby Dam has reduced the impacts of Libby Dam on temperatures of the Kootenai River compared to what would be expected of a deep water withdrawal. Changes in suspended sediment, bed scouring flows, and temperature have resulted in greatly increased periphyton growth (May et al. 1980). Prior to operation of the turbines, water released from the spillway or sluices caused gas supersaturation problems in the river. Gas supersaturation levels of over 130 percent were common (May and Huston 1973, 1974, 1975). More recently, water withdrawn from the reservoir has been subsaturated. Nighttime oxygen deficits in the Kootenai River have resulted from the action of heavy periphyton growth on already subsaturated water (May et al. 1981).

Changes in the aquatic biota in the Kootenai River can be attributed to no single factor. Construction of Libby Dam and improvement of water quality occurred during the same time period. Fish populations and the fishery of the Kootenai River were generally improved as a result. Gas supersaturation reduced whitefish populations by over 60 percent between 1973 and 1974 (May and Huston 1975). Whitefish population trend estimates decreased from 468 whitefish/1,000 feet of stream in a river section at Libby in 1973 to 165/1,000 feet in 1974. Elimination of the supersaturation problem resulted in increased whitefish abundance. Whitefish increased to 246/1,000 feet in 1975 and 711/1,000 feet in 1978. A decline in whitefish population to 546/1,000 feet in 1979 and 1980 led May et al. (1980) to believe carrying capacity of the river may have been exceeded before the population stabilized. Preliminary analysis of 1981 trend estimates indicate numbers of whitefish have increased to 770/1,000 feet, but that total biomass is about the same as in 1979 (Bruce May, Montana Department of Fish, Wildlife and Parks, Libby, Montana, personal communication). Growth rates of mountain whitefish have declined in recent years from previous levels (May et al. 1980).

Trout populations in the Kootenai were not as affected by gas supersaturation as whitefish populations. Nevertheless, many trout exhibited signs of gas bubble disease (May and Huston 1975). Rainbow trout trend estimates in the area around Libby increased from 24/1,000 feet in 1973 to 71/1,000 feet in 1974 (May and Huston 1975). Rainbow populations remained stable through 1977, then increased to 116/1,000 feet in 1978. A decline in 1979 was followed by an increase to 114/1,000 feet in 1980, and 202/1,000 feet in 1981 (May et al. 1981). Growth of rainbow trout has slowed as the population has increased. The total population of trout and whitefish may be high enough to cause some competition for food and space (May et al. 1980).

Abundance of westslope cutthroat trout has declined from 20/1,000 feet in 1973 and 25/1,000 feet in 1975 to numbers too low to estimate. The cutthroat population in the river after pre-impoundment and prior to 1975 was almost all from escapement of fish from Lake Koocanusa (May and Huston 1979). When reservoir escapement was reduced, the river population declined.

Construction of Libby Dam probably had negative impact on white sturgeon in the river below Kootenai Falls. Lower spring flows and cooler water temperatures may be responsible for a decline in the number of sturgeon below the falls (Graham 1981b). Good sturgeon populations remain in the Idaho portion of the Kootenai (Partridge 1981).

Despite the increased whitefish population, angling for whitefish has decreased considerably since impoundment. Nearly all of the fish harvested in winter prior to impoundment were whitefish. Whitefish comprised only 10 percent of the winter catch in 1977 and 16 percent in 1978 (May and Huston 1979). Anglers now concentrate on trout which are more abundant than before impoundment and more active at the warmer winter temperatures since impoundment.

Fishing pressure has increased dramatically since 1968. A mail survey estimated 116 man-days per mile of stream was expended in 1968. A similar survey conducted during the 1975-76 season estimated 406 man-days per mile on the 50 miles of river remaining after impoundment. A direct census of the four miles of river directly upstream of Kootenai Falls in 1978 estimated 1,630 man-days of fishing pressure per mile (Graham 1979).

Water quality of the Kootenai River was significantly improved during the period of construction of Libby Dam, but some improvements were not dam related. Effluents from a pulp mill and a fertilizer plant in Canada and a mine operation near Libby seriously degraded water quality. High levels of organic and metal pollutants depressed insect populations (Bonde and Bush 1975). Significant improvements in treatment of effluents were made during and after the period of dam construction. Because water quality was improved at about the same time the dam was built, it is difficult to determine whether subsequent effects on insects and fish populations are attributable to improved water quality or dam operation.

It is clear that regulation of the river altered the insect fauna from a diverse complex of species to one dominated by a few species. Stoneflies were almost completely eliminated from the Kootenai, while a few species of mayflies flourished (May et al. 1980).

The response of fish populations in Lake Koocanusa has been typical of impoundments. Initial increases in abundance of most species were noted (May and Huston 1977). Reservoir aging invariably results in decreased productivity. Abundance of some fish species has already begun to decline (May et al. 1979) but the reservoir has not yet stabilized (May and Huston 1980).

Abundance of all major gamefish except westslope cutthroat trout appeared to peak in 1978 and subsequently decreased (May and Huston 1980). Cutthroat were stocked in the reservoir and its tributaries until 1976, after which cutthroat abundance decreased. Abundance of cutthroat, rainbow and bull trout has decreased dramatically between 1978 and 1980, but at least some of the decrease may have been related to sampling error (May and Huston 1980). A small population of burbot has been increasing steadily since impoundment.

Most species of nongame fish have also followed predictable patterns since impoundment. Squawfish abundance peaked soon after impoundment and although expected to remain high, has decreased since 1976. Redside shiners have decreased dramatically as have longnose suckers. Abundance of peamouth and coarsescale suckers continues to increase.

Trout fishing in Lake Koocanusa has been good during spring and fall. Surface water temperature in summer is usually warm enough to force trout into deeper water, reducing their availability to anglers. Until recently, boat access to the reservoir in spring was limited by drawdown. Construction of low water boat ramps improved access. A winter burbot fishery in the Rexford area has become popular in the last two years.

Rainbow and cutthroat trout comprise most of the gamefish harvested from the reservoir. The cutthroat fishery was impaired by losses of cutthroat downstream out of the reservoir prior to operation of the powerhouse. Before the powerhouse was in operation, water was spilled through either the spillways or sluice ways and many fish were lost downstream (May et al. 1979). A selective water withdrawal system began operating in 1975. Cooperative studies between the Corps of Engineers and Montana Department of Fish and Game established a rule curve for operation of the selective withdrawal system that minimized downstream fish losses and provided river temperatures enhancing trout growth (May et al. 1979, McMullin 1979).

Wildlife

The Libby Dam project was the first hydroelectric project in the Columbia River drainage within Montana to seriously consider the wildlife resource and mitigation of losses to wildlife. An early report (Blair 1955) suggested that the total loss to waterfowl, upland game birds, and furbearers would be small in relation to the overall resource. Subsequent reports, however, stated that furbearers, principally beaver, muskrat, mink and otter would suffer a serious loss of habitat without any feasible means of mitigation; that a substantial population of native grouse would be displaced (Anonymous 1963); and that waterfowl utilization of the stream area proposed for development is small but significant (U.S. Department of Interior 1961).

The greatest concern for wildlife, however, was for big game. The project flooded approximately 25,700 acres (40 square miles) of wildlife habitat (U.S. Department of Interior 1965), including over 15,000 acres of critical big game winter range (Blair 1955) used by white-tailed deer, mule deer, elk, bighorn sheep and moose. Railroad relocation eliminated an additional 2,000 acres of critical deer winter range along the Fisher River, Wolf Creek and Fortine Creek (Firebaugh et al. 1975). Channelization and stream bank stabilization (rip-rap) conducted in conjunction with railroad relocation along these streams reduced the length of free-flowing stream by nearly two miles and disrupted another 9.7 miles (U.S. Army Corps of Engineers 1971). This either reduced or eliminated habitat for furbearers, ruffed grouse and a wide variety of nongame animals. Relocation of Highway 37 on the east side of the reservoir and a forest development road on the west side resulted in the loss of over 2,100 additional acres of wildlife habitat (U.S. Army Corps of Engineers 1971). In addition to the direct loss of habitat caused by these activities, other negative impacts have been noted, especially for bighorn sheep. The newly relocated Highway 37 cut through bighorn winter range and road kills and poaching are posing a problem (Ciliberti 1980).

Mitigation of Project Impacts

Fisheries

Fisheries mitigation for Libby Dam has included construction of a cutthroat trout hatchery near Rexford, Montana. Mitigation has been received in the form of minimum stream flows, and constraints on rate of river fluctuation and the removal of barriers in several tributaries to the reservoir and conversion of the fish populations in six reservoir tributaries from resident fish to migratory stocks. A selective withdrawal system was built at the request of the Environmental Protection Agency for water quality reasons.

Wildlife

The Water Resources Development Act of 1974 (Public Law 93-251) authorized expenditure of $2,000,000 for acquisition of up to 12,000 acres of wildlife grazing in mitigation of habitat losses resulting from the overall Libby Project (U.S. Army Corps of Engineers 1974). Prior to exhaustion of the authorized $2,000,000, however, just under 2,500 acres had been purchased. One of the parcels purchased for mitigation of big game lands lost through inundation of Libby Dam is the Kootenai Falls area, and portions of this parcel could be flooded if the proposed Kootenai Falls project is constructed. Although less than 2,500 acres were purchased as mitigation under PL93-251, there is only a remote chance that Congressional authorization and appropriation to purchase additional acreage up to 12,000 acres will occur. The sentiment of the current administration of Washington D.C. is for fewer government expenditures. There is also the general opposition by the public in Lincoln County to loss of more private land.

Studies to evaluate big game habitat manipulations (Campbell 1972a, 1972b; Campbell and Knoche 1974; Knoche 1974; and Knoche and Brown 1975) carried out by the U.S. Forest Service to improve winter range conditions on potential relocation sites for displaced animals, and on existing ranges, found that the procedures employed (primarily spring broadcast burning) failed to achieve desired results. Knoche and Brown (1975) found that big game use of treated areas has been less than on control areas and that there has been no demonstrable increase in game animal numbers on residual winter ranges for various reasons. They further state that habitat lost through impoundment was removed from the total land base capable of supporting big game resource and that animals forced from ancestral ranges did not simply resettle on adjacent ranges, but were gradually lost from the population. Population composition and fawn production data collected by Knoche and Brown (1975) were also indicative of a declining population.

Management Goals and Objectives

Fisheries

The fish program goal is to perpetuate aquatic species and their ecosystems and meet the public demand for fish in state waters. To meet this goal, aquatic communities and their habitat must be preserved, protected, and enhanced where feasible. Management is designed to equitably distribute angling opportunity.

Quality habitat is the key to fish populations. Preservation and protection of present habitat and restoration of degraded habitat (where feasible) is a very high priority. Fish habitat and populations should be managed on a drainage wide basis. For example, small tributaries used for spawning, larger streams used as fish passageways, and large rivers used for rearing are interrelated and must all be preserved to maintain migratory populations of fish that are common in Montana. Important components of fish habitat which must be maintained include; water quality, water quantity, physical integrity of stream channels and lakeshores, stream or lakeside vegetation, and adequate passage for migratory fish.

Specific objectives for the Kootenai drainage are:

1. To maintain the present 4,000 cfs minimum flow requirement
2. To maintain fish populations in the river and reservoir at no less than present levels; and
3. To protect the remaining river habitat.

Studies conducted during and after construction of Libby Dam have resulted in several recommendations to maintain excellent fisheries in the Kootenai River and Lake Koocanusa. The recommendations include:

1. Maintenance of a 4,000 cfs minimum flow below Libby Dam.

2. Constraints on the rate of which river level fluctuations may occur; and

3. Constraints on operation of the Libby Dam selective withdrawal system to enhance water temperatures in the Kootenai River while avoiding excessive downstream fish loss from the reservoir.

Wildlife

To protect, maintain, and enhance the available supply of all wildlife species and their habitats in the project area in order to meet the demand for all types of wildlife-oriented recreation.

Recommendations to Protect, Mitigate, and Enhance Fish and Wildlife Resources

Fisheries

1. Existing criteria on operations of Libby Dam for fisheries should be maintained unless conditions warrant a change in operation that would benefit the fishery (1.2.5).

The present criteria have proved to be adequate for maintaining good fish populations in the Kootenai River and Lake Koocanusa. However, fish populations in both the river and reservoir are still adjusting to post-impoundment conditions. Operational constraints may have to be modified as populations stabilize or conditions warrant.

2. Studies to determine instream flows adequate to insure successful immigration, emigration, spawning, and rearing of rainbow and cutthroat trout to tributaries of the Kootenai River and Lake Koocanusa should be initiated (1.3.1).

3. Periodic removal of aggrading material in Kootenai River tributary deltas should be undertaken (1.5.1).

Migration, corridors, spawning areas and rearing areas in tributaries of the Kootenai River and Lake Koocanusa must be maintained to encourage wild trout production. Instream flow reservations would guarantee ample water supply to maintain tributary habitat quality.

Instream flows for fish and wildlife are classified as beneficial uses of water in Montana and state law provides for instream flow reservations. Instream flow studies should be initiated on the following Kootenai River tributaries: Callahan, Quartz, Libby and O'Brien creeks, and the Fisher River. Lake Koocanusa tributaries of concern are Graves, Deep, Sinclair, Big, Bristow, Barron, and Five-Mile creeks.

Actions should be taken to improve access to tributary streams. Lack of spring scouring flows in the Kootenai River since impoundment has caused aggradation of materials at the mouths of many tributaries.

As these deltas continue to aggrade, access to the tributaries by migrating fish could be impaired.

4. Effects of Libby Dam operation on reproduction and rearing of white sturgeon in the Kootenai River should be assessed (1.2.6).

White sturgeon have been recommended for inclusion on the Montana endangered species list (Graham 1981b). The population of sturgeon below Kootenai Falls appears to have decreased since impoundment of the river. Studies should be undertaken to determine the status of the population, what effects Libby Dam has upon the population, and what can be done to preserve white sturgeon.

Wildlife

The primary recommendation for mitigating wildlife losses resulting from the construction of the project would be to obtain the balance of the 12,000 acres authorized for this purpose by PL 93-251. Suitable lands in the general area of the project could be acquired as they become available and/or management rights to private and/or public lands in the vicinity could be negotiated as described below. Since the 12,000 acres authorized for acquisition is less than the acreage lost through flooding this is the minimum recommended acreage to acquire and/or obtain such rights to.

For replacement of lost wildlife values to be realized through habitat improvement, either on-site or off-site, a larger acreage of land will usually be required than that actually flooded, even if intensively managed. This is due to two factors. First, the riparian habitat lost is generally more productive than replacement lands, and second, in most cases the lands to be managed are already occupied and superimposing new populations on those present will required more than a simple acre-for-acre replacement, plus intensive management.

On-site

Habitat manipulation on project lands to improve food and/or cover for various species of wildlife could help offset some of the wildlife values lost through construction of this project. Species to be managed for and appropriate techniques would have to be determined prior to initiating such practices.

Creation of permanent, relatively shallow water ponds, especially near the U.S.-Canada border, through construction of dikes to retain water during drawdowns or by trapping water from small streams or springs could benefit many species. Islands that would be above the high water level could be constructed at the same time as dikes, and would provide nesting waterfowl with additional nest sites. Stabilization of water levels behind such dikes would allow submerged and emergent aquatic vegetation to establish themselves, along with cottonwoods, willows, etc. along shorelines. This would benefit many species, especially aquatic furbearers and nongame in addition to waterfowl. If deep enough to support fish year-round, such areas might also provide additional and/or better foraging areas for osprey and bald eagles nesting in the vicinity.

Opportunities for on-site improvement of wildlife values on existing projects are limited to project waters and generally narrow land boundaries. As an alternative to on-site activities and/or to further improve the wildlife values in the project vicinity, off-site enhancement of a designated species, or group of species, as compensation for previously unmitigated wildlife losses may be necessary.

Off-site

See recommendations for Hungry Horse or Kerr Projects.

GENERAL RECOMMENDATIONS

PROGRAM DEVELOPMENT

1. The Council should consider the water needs of the fish and wildlife resources in the State of Montana and effects on these resources of any suggested changes in allocation of historical water storage for any down-stream uses for power, flood storage, fish and wildlife or other uses (1.8.3).

A major concern in the development of the fish and wildlife program will be insuring adequate flows in the lower and middle Columbia River Basin for fish passage. The Council should not limit itself to consideration of existing up-river storage projects to meet those needs. Rather the Council should investigate the possibility of building storage capacity in the affected river basins. Montana's fish and wildlife has been impacted considerably from construction of existing projects and operational changes that would negatively impact the remaining resources should be avoided as a first priority.

2. The Council should consider the impacts of advanced energy withdrawal from storage reservoirs on reservoir and downstream fish and wildlife resources to insure that an effective fish and wildlife program can be implemented (5.3).

Industrial users (D.S.I.s) can request advanced energy withdrawal from Bonneville Power Administration which has led to early drafting of Hungry Horse Reservoir in the past. It is probable that this early draft (July and August) would leave insufficient quantities of water in the reservoir to meet the fish flows and reservoir elevations requested for that project. If these withdrawals occurred independently of the adopted fish and wildlife program, the ability to mitigate for fishery losses through this process would be questionable.

3. The Council should support the development of a process that protects aquatic and wildlife resources of significant value from future hydroelectric development. This would be a form of mitigation for past development needed to establish an essential balance between rivers and reservoirs. Highest priority should go to streams that could not be adequately mitigated (1.9.3).

Class one streams in the Montana portion of the Columbia River Basin are limited in number and valuable as a recreational resource. Most of these streams have some hydroelectric potential. Based on the set of criteria used to rate these streams, the Council should investigate and create, if necessary, a process for protecting these streams under the framework of the Act or support creation of additional legislation.

An additional concern is the protection of mitigation received from existing or future hydro developments. An example is the Kootenai River. As mitigation for Libby Dam, minimum stream flows and limits on rate of river fluctuation were implemented to enhance the fishery downstream. In recent years, several hydroelectric projects have been proposed on that reach of river. All the projects could have a negative impact on the fishery and could degrade enhancement measures which were mitigation for Libby Dam.

One argument is that each project should be considered on its own merit, or that mitigation for the new project would include replacement of lost mitigation from previous projects. While this sounds logical, the fallacy of the argument can best be demonstrated by looking at the well documented decline of the salmon and steelhead runs in the Columbia River system. Project impacts are cumulative, and no new stream resource is created in the process of mitigation. The only logical conclusion is to protect the best of what is left.

4. The Council should include in the fish and wildlife program a method to insure that mitigation for fish and wildlife losses is a mandatory part of the process of planning, licensing and development of projects (5.1).

Section 4(h)(11)(A) of the Act addresses this subject. The Council should also secure agreement from involved agencies to abide by existing state laws particularly in respect to licensing and exemption of hydroelectric projects.

5. The Council should address the cumulative impacts of existing and future hydro-development in its fish and wildlife program. Cumulative impacts should be addressed at the first level of appraisal before a project is proposed and include a firm commitment to an adequate mitigation plan (5.2).

The Northwest Power Planning Act offers a unique opportunity to bring the issue of cumulative or basin-wide impacts into the planning decision. The data base has often been too limited or the developing agencies have had too narrow a range of accountability for their impacts. Environments can usually rebound from a certain amount of stress, but as the frequency and amount of stress increases, the system begins to collapse. The potential impacts of micro-hydro development might be a good example.

6. Potential site-specific and cumulative impacts of small scale and micro-hydroelectric projects (installed capacity of five megawatts or less) should be evaluated to insure that the resource assessment goals and objectives established by the Council in the Energy Plan are compatible with the intent of the fish and wildlife program (5.4).

The Act identifies conservation and renewable resources as the two top priorities to meet future electric energy needs. Hydroelectric development is viewed as a renewable resource. All indications are that the direction of future hydroelectric development will be small and micro-scale projects.

Concerns were raised at public meetings and by agencies over the potential impacts of these projects on resident migratory fisheries. Issues identified included the potential conflict between a resource assessment plan that would encourage and provide economic incentive to develop these sites and a Fish and Wildlife Program aimed at mitigating existing impacts on migratory fish. Another issue was that the cumulative impact of a number of small-scale developments could have a large impact even if impacts of individual projects are relatively small.

A high priority should go to collecting basin-wide baseline data on the potential impacts of small-scale hydro development on fish and wildlife in areas where development seems imminent or likely. This assessment should include developing passage criteria for affected migratory fish species.

Another important data need is developing a methodology for estimating "flow duration curves" for ungauged streams. Such curves consist of a plot of stream flow versus percentage of time for which a particular flow is exceeded. This information would be useful in assessing hydroelectric power potential and also in determining instream flow requirements to preserve stream habitat and insure successful perpetuation of migratory fish stocks. Guidelines should also be developed which can be used by fish and wildlife agencies and by developers to determine the suitability of specific sites for such projects.

7. *Include formal resident fisheries representation in all matters of Columbia River Power System planning, management, and operation to provide equitable treatment for resident fisheries.*

Mitigation for Future Projects

This section addresses only wildlife concerns because we felt the impacts on fisheries resulting from the various types of potential projects were too complex to form generalized recommendations in this time frame. Many of the general recommendations or concepts would apply however.

History of Wildlife Concerns

Man's utilization of the land is causing continuous degradation and loss of wildlife habitat throughout the United States. Water development projects are responsible for the loss of a large amount of riparian habitat, especially in the more arid western states where such habitat is at a premium.

Riparian ecosystems are recognized as some of the most productive and diverse ecosystems, capable of producing and supporting impressive vegetative and animal populations (Teskey and Hinckley 1977). In addition to supporting some of the most productive and diverse wildlife populations in the U.S., riparian ecosystems also play an important, if not essential role in maintaining wildlife populations in adjacent uplands (Hirsch and Segelquist 1978). These wildlife values of riparian ecosystems have long been recognized, and two symposia devoted to protection, preservation and management of remaining riparian zones have recently been held (Johnson and Jones 1977; Johnson and McCormick 1978). Much of the discussion at both of these symposia dealt with the value and importance of riparian ecosystems to various forms of wildlife. Although not part of the main theme of these symposia, mitigation was nevertheless frequently mentioned, especially in the latter (1978) session.

A national symposium devoted to mitigating losses of fish and wildlife habitat was held in 1979 (Swanson 1979). In the preface to this symposium, Melander and Swanson (1979) describe how fish and wildlife conservationists have been deeply concerned for years about habitat losses resulting from large federal development projects but that the Fish and Wildlife Coordination Act (FWCA), designed to minimize or mitigate such losses, has proven to be ineffective in doing so.

Inundation of essential terrestrial wildlife habitats by water development projects represents a major environmental impact due to the significant and permanent commitment of resources. Serious attempts at mitigating wildlife losses from development projects are a relatively recent phenomenon and one which has generally been wholly inadequate in replacing wildlife values lost. Montana is not unique in this regard, as this has apparently been the standard procedure throughout the country as evidenced by continued reference to these failures in many of the papers at the mitigation symposium (see for example Prosser et al. 1979, Broach 1979, Dziedzic and Oliver 1979, and others).

Wildlife Problems

The problems associated with permanent flooding of terrestrial wildlife habitats have been fairly intensively covered in the problem statements related to specific existing projects. However, other impacts associated with dams occur both upstream and downstream from impoundments.

Upstream impacts include deposition of sediment, causing general aggradation of the upstream channel and its tributaries (Simons 1979). This results in a general increase in river bed elevation which in turn increases flood stage and the potential for increased flood damage. This may also result in increased seepage and an increase in water table elevations which can affect riparian vegetation, land use and drainage requirements (Simons 1979). Effects of such upstream changes on wildlife would probably be minimal but essentially beneficial. These would include a tendency to maintain or possibly slightly increase riparian vegetation due to raised water table levels. Some increase in deciduous riparian shrubs and trees would be expected in the delta area where silt and clay deposits form and are above water for a sufficient period annually.

Downstream impacts would be of greater magnitude and would be detrimental from the standpoint of wildlife values. These include degradation of the downstream channel due to the release of essentially clear (sediment-hungry) water which obtains its equilibrium load by picking up sediment from the streambed and eroding stream banks. Channel degradation increases the gradient of local tributaries, which in turn suffer degradation and increased bank erosion (Simons 1979). Channel changes, channel degradation, and improved drainage may cause a lowering of the flood plain water table and result in changes in vegetation. Destruction of islands and lack of new ones being deposited results in a net loss of habitat affecting many species of wildlife.

Significant adverse impacts on wildlife downstream from a major hydroelectric development in southeastern Montana were documented by Martin (1977). In that study, beaver populations in the unregulated Yellowstone River were larger than those in the Tongue and Bighorn rivers which are both regulated by dams. Depressed beaver populations in the regulated rivers as compared to the unregulated river were related to habitat loss resulting from upstream impoundment. Pre and post-impoundment comparisons on the Bighorn River downstream from Yellowtail Dam revealed significant reductions of islands and gravel bars (51 percent in number and 77 percent in area) and also of vegetated islands (23 percent in number and 31 percent in area) which constitute prime beaver habitat in that area.

Although furbearers were the subject of Martin's (1977) study, habitat losses of that magnitude undoubtedly have a negative impact on a large number of wildlife species.

Recommendations

1. Project design should include acquisition of lands (beyond those strictly essential to project operations) to aid in offsetting project-caused wildlife losses. These should be acquired at the same time as other project lands and be included in basic project costs. The construction agency should grant management easements or rights on these lands to the fish and wildlife agency responsible for the impacted resources, and should also provide funding to permit development, operation, and management of the area for the expected life of the project.

The typically inherent fertility of flood plains and their diverse and productive ecosystems are features that cannot be replaced on the shores of reservoirs. Furthermore, the shoreline areas best suited for habitat improvement are generally pre-empted for other uses. Replacement of lost wildlife values on such lands requires intensive management to successfully superimpose new populations upon already existing ones. Since the most productive areas are lost and less productive lands, even under intensive management, cannot generally substitute for such lost lands on an acre-for-acre basis, replacement acreage will have to be greater than actual acreage lost. In addition, destroyed habitat often serves as essential habitat for animals ranging over much larger areas during noncritical times of the year. An accepted methodology should be employed to determine the net loss of wildlife values and the amount of mitigation required to offset these losses. The Habitat Evaluation Procedure developed by the U.S. Fish and Wildlife Service (U.S. Department of Interior, Fish and Wildlife Service 1980) may suit this purpose.

Where acquisition and management of on-site project lands is not feasible for various reasons, the following would be recommended.

2. Where the previous recommendation is not feasible, acquisition of lands and/or management rights should be obtained by the construction agency in off-site areas. Management rights to these lands should in turn be conveyed to the fish and wildlife agency responsible for the resources affected.

Where on-site efforts are not feasible it will be necessary to provide intensive off-site management to replace lost wildlife values. However, it may not be necessary to directly acquire lands for this purpose. This region has a considerable amount of land in federal ownership, and if construction agencies could successfully negotiate management rights and delegate these to the appropriate fish and wildlife agency the desired benefits could be obtained at a lower overall cost. Whether actual lands, or only management rights are acquired, development, operations, and management of such areas would be primarily for wildlife, this option would not preclude development of other resources or land uses if compatible with wildlife management objectives.

3. Public hearings should be held to insure that any decisions regarding acceptance or rejection of proposed recommendations to prevent or lessen project-caused impacts on wildlife are made with full public knowledge, input, and review.

In the past, construction agencies have often rejected proposed measures to protect fish and wildlife from project impacts in order to achieve favorable cost/benefit ratios or relieve certain project beneficiaries from funding mitigation costs (Jahn 1979). It is necessary that the public knows the reasoning behind acceptance or rejection of mitigation recommendations and be included in the decision making process.

4. Public access to wildlife mitigation lands for a given project must be assured. Also included should be provision of facilities (i.e., parking areas, boat ramps, etc.) which will allow utilization of these resources by the public.

It makes little sense to develop the resources if public utilization is denied. However, public agencies charged with managing the fish and wildlife resources on these lands should retain the right to restrict the timing and/or mode of public access in order to protect fish and wildlife (i.e. nesting waterfowl).

5. Continuing investigations should be carried out to evaluate the success of post-construction mitigative management efforts.

Such studies are necessary to determine whether ongoing mitigation efforts are accomplishing their goals or not. They can also result in modifications of current management activities and lead to improved decision making regarding such activities on future projects.

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APPENDIX A

Background on the Regional Power
Planning Bill and Council

From

Request for Proposal
Package Number 81-001

Pacific Northwest Regional Energy Planning

Background

The hydro resources of the Pacific Northwest (PNW) are no longer sufficient to meet all of the electric power needs of the region. Future growth in electricity demand will therefore have to be satisified by resources other than conventional large hydropower. While the Region has embarked upon the building of a number of thermal power plants, the substantially higher costs and environmental impacts of such plants have raised serious questions regarding the optimum methods for developing resources to satisfy future electricity needs.

The Bonneville Power Administration (BPA), a Federal agency which generates and markets approximately half the electric power consumed in the PNW, has been attempting to take a lead role in the planning, building, and operating of the region's entire electric power system on a coordinated basis. BPA is statutorily required to give preference in the allocation of the Federal resources to co-ops and publicly owned utilities, who are known as the "preference customers". In 1976, BPA's projections of its loads and resources indicated that the Federal resources available would be short for preference customers, and that BPA would no longer be able to guarantee preference customers that their load growth could be met beyond 1983. BPA issued a notice of insufficiency to these customers.

Issues related to the sufficiency of future electric power availability created much controversy in the PNW, and raised numerous questions regarding the institutional aspects of the development, sale, and distribution of electric power from Federal resources. Other important issues such as long term planning for electricity supply, priorities in the development of new resources and coordination of power supply planning also had to be addressed. In an attempt to develop a cooperative solution which preserved local options, while maintaining the benefits of Federal resources and an integrated electric system, several alternatives were explored, but no agreement was easily reached within the PNW. In order to avoid extensive legal battles over complex issues related to the allocation of Federal hydropower resources, the PNW turned to the U.S. Congress for a solution. After much deliberation, including many hearings in the Region, as well as in Washington, D.C., Congress devised methods to protect the preference customers and yet provide the benefits of Federal hydropower to residential and farm customers of private utilities. In 1980, Congress passed the Pacific Northwest Electric Power Planning and Conservation Act (PL96-501).

The Pacific Northwest Electric Power Planning and Conservation Act

The major purposes of the Pacific Northwest Electric Power Planning and Conservation Act are quoted below:

"(1) To encourage, through the unique opportunity provided by the Federal Columbia River Power System -

(A) Conservation and efficiency in the use of electric power, and

(B) The development of renewable resources within the Pacific Northwest:

(2) To assure the Pacific Northwest of an adequate, efficient, economical and reliable power supply;

(3) To provide for the participation and consultation of the Pacific Northwest States, local governments, consumers, customers, users of the Columbia River System (including Federal and State fish and wildlife agencies and appropriate Indian tribes), and the public at large within the Region in -

(A) The development of regional plans and programs related to energy conservation, renewable resources, other resources, protecting, mitigating, and enhancing fish and wildlife resources;

(B) Facilitating the orderly planning of the Region's power system; and

(4) To provide that the customers of the Bonneville Power Administration and their consumers continue to pay all costs of the Region's electric power requirements, including the amortization on a current basis of the Federal investment in the Federal Columbia River Power System;

(5) To insure, subject to the provisions of this Act -

(A) That the authorities and responsibilities of State and local governments, electric utility systems, water management agencies and other non-Federal entities for the regulation, planning, conservation, supply, distribution, and use of electric power shall be construed to limit or restrict the ability of customers to take actions in accordance with other applicable provisions of Federal or State law, including, but not limited to, actions to plan, develop and operate resources and to achieve conservation, without regard to this Act; and

(6) To protect, mitigate and enhance the fish and wildlife, including related spawning grounds and habitat, of the Columbia River and its tributaries, particularly anadromous fish which are of significant importance to the social and economic well-being of the Pacific Northwest and the Nation and which are dependent on suitable environmental conditions substantially obtainable from the management and operation of the Federal Columbia River Power System and other power generating facilities on the Columbia River and its tributaries."

The Act directs that BPA should continue its traditional role of generating, transmitting, and marketing power; as well as carry out additional responsibilities. Under the Act, BPA must acquire all necessary energy resources to serve utilities who choose to apply to BPA for wholesale power supplies. BPA remains accountable to the residents of the PNW for the actions it takes to meet the Region's electric power needs. The Act contains checks and balances to insure that all customers of BPA are treated equitably. The Act establishes the Pacific Northwest Electric Power and Conservation Planning Council to develop a Regional Plan which will emphasize the development of conservation and renewable resources. The council consists of two members from each of the four Northwest States (Washington, Oregon, Idaho and Montana) and thus emphasizes local control of resource development options. The major provisions of the Act are summarized below:

-The Council will draw up a regional plan for meeting the electrical needs of the region, taking into account the social and economic effects of alternative courses of action. The plan must give highest priority to cost-effective conservation, treating it as a resource preferable to all other means of responding to demand for electricity. Renewable sources of energy must be given next highest priority in the Region's power planning, to the extent that they are cost-effective ranking ahead of conventional thermal generating resources. Among thermal options, fuel-efficient methods of producing energy must be given priority.

-BPA becomes responsible for meeting the loads of customers and managing the regional electrical system to achieve the purposes of the Act relating to fish, system efficiency and experimental projects. BPA must give priority to cost-effective conservation and renewable resources in meeting the Region's needs. BPA may also purchase the generating capabilities of new thermal projects, but only after determinination that they are required in addition to all cost-effective conservation and renewables that can be achieved or developed in time. Such projects must also be found reliable and compatible with the regional electric system. BPA will spread the benefits and the costs of resources among all of its customers through its rates.

-The supply preference and resulting price advantages to co-ops and publicly owned utilities by Federal law are protected and enhanced. BPA is given the responsibility of meeting the full future requirements of preference customers -- something BPA was not previously authorized to do.

-The residential and farm customers of investor-owned utilities will receive rate relief. The utilities sell to Bonneville, at the average cost of their power, an amount of electric energy equal to their residential and farm loads. BPA will sell to them, in return, enough energy at BPA standard rates to cover these residential and farm loads. The rate advantages cannot enhance company profits, but must be passed on directly to the customers.

-Direct service industries will receive new 20-year contracts for power from BPA, but at a higher price than they are paying under existing contracts. They will, in effect, pay the cost of rate relief to the residential and farm customers of investor-owned utilities during the first four years, and a substantial portion thereafter, which they agreed to do in exchange for assurances of long-term supplies.

-BPA will sell electricity at a rate that reflects the melded cost of Federal hydropower and more expensive thermal resources, conservation and renewable sources of energy. The Act contains incentives, as well, to encourage conservation and renewables. BPA may credit utilities for their individual actions to implement conservation and renewables.

-The Council will establish a program to protect and enhance the fisheries resources of the Columbia River and to mitigate damage already done to anadromous fish. Funding for the program is to come from BPA rate revenue.

-All planning for electric resources and fish protection must involve the public. State and local control of land use and water rights is protected under the Act and the decision to allow construction of new resources is left with utilities and state siting authorities.

Role and Responsibilities of the Council

The Pacific Northwest Electric Power Planning and Conservation Act (Regional Act) has estalbished the Pacific Northwest Electric Power and Conservation Planning Council, which comprises of two voting members representing each of the States of Washington, Oregon, Idaho, and Montana. The major task of the Council is ot adopt a regional electric power and conservation plan ("Regiona plan" or "the plan") within two years, and to update it periodically. Section B describes in detail the requirements of the Regional energy plan and a functional description of the plan as prepared by the Council. The plan, adopted by the Council, becomes the basis for BPA's actions in meeting the loads of its customers in the PNW. If BPA wants to acquire resources not consistent with the plan, specific Congressional approval will be required prior to any commitment to BPA.

The Regional plan will represent the Council's blueprint for meeting the Region's future electrical energy needs. The plan is not envisioned to be a static document and the Council may amend it from time to time, as is required under tha Act to review the plan at least every five years. The Act also provides additional definition of the role and responsibilities of the Council, some of which are highlighted below.

Public Involvement

The Act requires that the public be given opportunities to present information and views to the Council before any major decisions are made. The Council must reglarly inform the public of its objectives, organization, and activities. Before adopting the Plan, the Council must hold public hearings in Washington, Oregon, Idaho, and Montana. The Council is required to maintain a comprehensive and continuing program to ensure widespread public involvement in the policymaking process. It must also solicit advise from BPA, utilities, state agencies, regulatory commissions, and others.

Planning Priorities

The Act mandates the Council to adopt a plan which requires investment in all cost-effective conservation and renewable resources before investment in conventional resources such as fossil fuel and nuclear plants. The following order of priorities is set up in the Act:

1. Conservation

2. Renewable resources

3. Resources relying on waste heat from industrial processes or in conventional fuels used in high-efficiency conversion processes.

4. Other resources.

Conservation is provided at 10% of premium over conventional resources. In other words, conservation is considered to be cost-effective, even if the cost of conservation measures is as high as 110% of the costs of conventional generation.

Environmental Considerations

The Act requires that the Council carefully weigh environmental impacts of proposed projects. The Act requires that the Council strike a healthy balance between environmental and energy needs in all of its decisions.

Fish and Wildlife

Because of the importance of questions related to migratory fish in the Columbia and other rivers in the PNW, protection of fish and wildlife is an important aspect of the Act. The Act provided the means for interested parties to cooperatively work out a plan for enhancing fish runs and wildlife dependent on PNW rivers. The Council must, in completing the Regional Plan, seek recommendations from Federal and state fisheries agencies and Indian tribes for a fish management program, and adopt a program to protect, mitigate, and enhance fish and wildlife. This program and related considerations will affect the development of new power resources.

Compatibility with the Regional Energy System

In developing the plan, the Council must consider whether the proposed resources are compatible with the operating realities such as the reliability and the need for reserves of the existing Regional Electric Energy System.

Goal Statement

The goal statement provided below paraphrases the requirements of the Regional Act and is intended to make more clear what the Council is attempting to accomplish through the planning process.

The mission of the Northwest Planning Council is threefold:

1. To provide accountable leadership in electricity planning and policy formulation for the Pacific Northwest.

2. To plan for the management of electricity demand and supply to sustain such growth of the economy as is anticipated and to sustain a healthy environment, at the lowest total cost.

3. To secure regional consensus on energy development and utilization.

Therefore, under the authority of PL 96-501 and the appropriate state laws, the Council will pursue the following goals:

-To provide an adequate, reliable and cost-effective supply of electricity.

-To protect and enhance environmental quality.

-To secure implementation of all cost-effective electricity conservation.

-To stimulate the development and implementation of cost-effective renewable and alternative energy resources, both as a source of electricity and as a substitute for electricity.

-To increase the stocks of anadromous fish on the Columbia River and other Northwest rivers, balancing the needs of the region for both fish and power production.

-To review the cost-effectiveness of the basic assumptions underlying the planning and operation of the region's electricity supply system.

-To provide public education about regional electric power issues, particularly future rate impacts.

-To facilitate and encourage public participation in resolution of these issues.

-To maintain low rates made possible by the hydropower development in the Pacific Northwest while stimulating investment and consumption decisions as if rates reflected the high costs of new thermal resources.

-To provide a stable planning environment for prompt, conclusive decisions on electric energy issues.

-To prepare a demand forecast with sufficient end-use detail so that conservation progress can be monitored and evaluated on a continuing basis.

-To identify and eliminate institutional barriers to the implementation of cost-effective conservation and renewable resources.

-To develop a reliable power plan which realistically can be supported by the regional economy and national capital markets.

APPENDIX B

A Portion of the Pacific Northwest Electric Power Planning and Conservation Act Regarding the Fish and Wildlife Program

(h)(1)(A) The Council shall promptly develop and adopt, pursuant to this subsection, a program to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat, on the Columbia River and its tributaries. Because of the unique history, problems, and opportunities presented by the development and operation of hydroelectric facilities on the Columbia River and its tributaries, the program, to the greatest extent possible, shall be designed to deal with that river and its tributaries as a system.

(B) This subsection shall be applicable solely to fish and wildlife, including related spawning grounds and habitat, located on the Columbia River and its tributaries. Nothing in this subsection shall alter, modify, or affect in any way the laws applicable to rivers or river systems, including electric power facilities related thereto, other than the Columbia River and its tributaries, or affect the rights and obligations of any agency, entity, or person under such laws.

(2) The Council shall request, in writing, promptly after the Council is established under either section 4(a) or 4(b) of this Act and prior to the development or review of the plan, or any major revision thereto, from the Federal, and the region's State, fish and wildlife agencies and from the region's appropriate Indian tribes, recommendations for—

(A) measures which can be expected to be implemented by the Administrator, using authorities under this Act and other laws, and other Federal agencies to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat, affected by the development and operation of any hydroelectric project on the Columbia River and its tributaries;

(B) establishing objectives for the development and operation of such projects on the Columbia River and its tributaries in a manner designed to protect, mitigate, and enhance fish and wildlife; and

(C) fish and wildlife management coordination and research and development (including funding) which, among other things, will assist protection, mitigation, and enhancement of anadromous fish at, and between, the region's hydroelectric dams.

(3) Such agencies and tribes shall have 90 days to respond to such request, unless the Council extends the time for making such recommendations. The Federal, and the region's, water management agencies, and the region's electric power producing agencies, customers, and public may submit recommendations of the type referred to in paragraph (2) of this subsection. All recommendations shall be accompanied by detailed information and data in support of the recommendations.

(4)(A) The Council shall give notice of all recommendations and shall make the recommendations and supporting documents available to the Administrator, to the Federal, and the region's, State fish and wildlife agencies, to the appropriate Indian tribes, to Federal agencies responsible for managing, operating, or regulating hydroelectric facilities located on the Columbia River or its tributaries, and to any customer or other electric utility which owns or operates any such facility. Notice shall also be given to the public. Copies of such recommendations and supporting documents shall be made available for review at the offices of the Council and shall be available for reproduction at reasonable cost.

(B) The Council shall provide for public participation and comment regarding the recommendations and supporting documents, including an opportunity for written and oral comments, within such reasonable time as the Council deems appropriate.

(5) The Council shall develop a program on the basis of such recommendations, supporting documents, and views and information obtained through public comment and participation, and consultation with the agencies, tribes, and customers referred to in subparagraph (A) of paragraph (4). The program shall consist of measures to protect, mitigate, and enhance fish and wildlife affected by the development, operation, and management of such facilities while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply. Enhancement measures shall be included in the program to the extent such measures are designed to achieve improved protection and mitigation.

(6) The Council shall include in the program measures which it determines, on the basis set forth in paragraph (5), will—

(A) complement the existing and future activities of the Federal and the region's State fish and wildlife agencies and appropriate Indian tribes;

(B) be based on, and supported by, the best available scientific knowledge;

(C) utilize, where equally effective alternative means of achieving the same sound biological objective exist, the alternative with the minimum economic cost;

(D) be consistent with the legal rights of appropriate Indian tribes in the region; and

(E) in the case of anadromous fish—

(i) provide for improved survival of such fish at hydroelectric facilities located on the Columbia River system; and

(ii) provide flows of sufficient quality and quantity between such facilities to improve production, migration, and survival of such fish as necessary to meet sound biological objectives.

(7) The Council shall determine whether each recommendation received is consistent with the purposes of this Act. In the event such recommendations are inconsistent with each other, the Council, in consultation with appropriate entities, shall resolve such inconsistency in the program giving due weight to the recommendations, expertise, and legal rights and responsibilities of the Federal and the region's State fish and wildlife agencies and appropriate Indian tribes. If the Council does not adopt any recommendation of the fish and wildlife agencies and Indian tribes as part of the program or any other recommendation, it shall explain in writing, as part of the program, the basis for its finding that the adoption of such recommendation would be—

(A) inconsistent with paragraph (5) of this subsection;

(B) inconsistent with paragraph (6) of this subsection; or

(C) less effective than the adopted recommendations for the protection, mitigation, and enhancement of fish and wildlife.

(8) The Council shall consider, in developing and adopting a program pursuant to this subsection, the following principles:

(A) Enhancement measures may be used, in appropriate circumstances, as a means of achieving offsite protection and mitigation with respect to compensation for losses arising from the development and operation of the hydroelectric facilities of the Columbia River and its tributaries as a system.

(B) Consumers of electric power shall bear the cost of measures designed to deal with adverse impacts caused by the development and operation of electric power facilities and programs only.

(C) To the extent the program provides for coordination of its measures with additional measures (including additional enhancement measures to deal with impacts caused by factors other than the development and operation of electric power facilities and programs), such additional measures are to be implemented in accordance with agreements among the appropriate parties providing for the administration and funding of such additional measures.

(D) Monetary costs and electric power losses resulting from the implementation of the program shall be allocated by the Administrator consistent with individual project impacts and systemwide objectives of this subsection.

(9) The Council shall adopt such program or amendments thereto within one year after the time provided for receipt of the recommendations. Such program shall also be included in the plan adopted by the Council under subsection (d).

(10)(A) The Administrator shall use the Bonneville Power Administration fund and the authorities available to the Administrator under this Act and other laws administered by the Administrator to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project of the Columbia River and its tributaries in a manner consistent with the plan, if in existence, the program adopted by the Council under this subsection, and the purposes of this Act. Expenditures of the Administrator pursuant to this paragraph shall be in addition to, not in lieu of, other expenditures authorized or required from other entities under other agreements or provisions of law.

(B) The Administrator may make expenditures from such fund which shall be included in the annual or supplementary budgets submitted to the Congress pursuant to the Federal Columbia River Transmission System Act. Any amounts included in such budget for the construction of capital facilities with an estimated life of greater than 15 years and an estimated cost of at least $1,000,000 shall be funded in the same manner and in accordance with the same procedures as major transmission facilities under the Federal Columbia River Transmission System Act.

(C) The amounts expended by the Administrator for each activity pursuant to this subsection shall be allocated as appropriate by the Administrator, in consultation with the Corps of Engineers and the Water and Power Resources Service, among the various hydroelectric projects of the Federal Columbia River Power System. Amounts so allocated shall be allocated to the various project purposes in accordance with existing accounting procedures for the Federal Columbia River Power System.

(11)(A) The Administrator and other Federal agencies responsible for managing, operating, or regulating Federal or non-Federal hydroelectric facilities located on the Columbia River or its tributaries shall—

(i) exercise such responsibilities consistent with the purposes of this Act and other applicable laws, to adequately protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat, affected by such projects or facilities in a manner that provides equitable treatment for such fish and wildlife with the other purposes for which such system and facilities are managed and operated;

(ii) exercise such responsibilities, taking into account at each relevant stage of decisionmaking processes to the fullest extent practicable, the program adopted by the Council under this subsection. If, and to the extent that, such other Federal agencies as a result of such consideration impose upon any non-Federal electric power project measures to protect, mitigate, and enhance fish and wildlife which are not attributable to the development and operation of such project, then the resulting monetary costs and power losses (if any) shall be borne by the Administrator in accordance with this subsection.

(B) The Administrator and such Federal agencies shall consult with the Secretary of the Interior, the Administrator of the National Marine Fisheries Service, and the State fish and wildlife agencies of the region, appropriate Indian tribes, and affected project operators in carrying out the provisions of this paragraph and shall, to the greatest extent practicable, coordinate their actions.

(12)(A) Beginning on October 1 of the first fiscal year after all members to the Council are appointed initially, the Council shall submit annually a detailed report to the Committee on Energy and Natural Resources of the Senate and to the Committees on Interstate and Foreign Commerce and on Interior and Insular Affairs of the House of Representatives. The report shall describe the actions taken and to be taken by the Council under this Act, including this subsection, the effectiveness of the fish and wildlife program, and potential revisions or modifications to the program to be included in the plan when adopted. At least ninety days prior to its submission of such report, the Council shall make available to such fish and wildlife agencies, and tribes, the Administrator and the customers a draft of such report. The Council shall establish procedures for timely comments thereon. The Council shall include as an appendix to such report such comments or a summary thereof.

(B) The Administrator shall keep such committees fully and currently informed of the actions taken and to be taken by the Administrator under this Act, including this subsection.

(i) The Council may from time to time review the actions of the Administrator pursuant to sections 4 and 6 of this Act to determine whether such actions are consistent with the plan and programs, the extent to which the plan and programs is being implemented, and to assist the Council in preparing amendments to the plan and programs.

(j)(1) The Council may request the Administrator to take an action under section 6 to carry out the Administrator's responsibilities under the plan.

(2) To the greatest extent practicable within ninety days after the Council's request, the Administrator shall respond to the Council in writing specifying—

(A) the means by which the Administrator will undertake the action or any modification thereof requested by the Council, or

(B) the reasons why such action would not be consistent with the plan, or with the Administrator's legal obligations under this Act, or other provisions of law, which the Administrator shall specifically identify.

(3) If the Administrator determines not to undertake the requested action, the Council, within sixty days after notice of the Administrator's determination, may request the Administrator to hold an informal hearing and make a final decision.

(k)(1) Not later than October 1, 1987, or six years after the Council is established under this Act, whichever is later, the Council shall complete a thorough analysis of conservation measures and conservation resources implemented pursuant to this Act during the five-year period beginning on the date the Council is established under this Act to determine if such measures or resources:

(A) have resulted or are likely to result in costs to consumers in the region greater than the costs of additional generating resources or additional fuel which the Council determines would be necessary in the absence of such measures or resources;

(B) have not been or are likely not to be generally equitable to all consumers in the region; or

(C) have impaired or are likely to impair the ability of the Administrator to carry out his obligations under this Act and other laws, consistent with sound business practices.

(2) The Administrator may determine that section 3(4)(D) shall not apply to any proposed conservation measure or resource if the Administrator finds after receipt of such analysis from the Council that such measure or resource would have any result or effect described in subparagraph (A), (B) or (C) of paragraph (1).

APPENDIX C

Criteria employed in evaluating the quality
of stream fishery resources in Montana
(U.S. Department of Interior, Geological Survey 1980).

Fish habitats were assigned to one of six value classes:

Value Class	Class definition
I	Highest-value fishery resource
II	High priority fishery resource
III	Substantial fishery resource
IV	Moderate fishery resource
V	Limited fishery resource
VI	Not yet classified

CRITERIA

1. Occurrence of State or Federal endangered species.

2. Occurrence of State or Federal threatened species.

3. Species of high interest to the State.

4. Habitat restoration, reclamation, or mitigation potential.

A value class was determined for criteria 3 and 4 (above) as follows:

3. Species of High Interest:

Value Class I — Habitat maintaining outstanding populations of species of high interest. To include self-sustaining "wild" populations that maintain a high yield or represent an exceptional aesthetic, scientific, economic, educational, or recreational value.

Value Class II — Priority habitat for highly valued species and/or outstanding habitat for less highly valued species.

Value Class III — Substantial habitat for highly valued species and/or priority habitat for less highly valued species.

Value Class IV — Moderate habitat for highly valued species and/or substantial habitat for less highly valued species.

Value Class V — Limited fish habitat.

4. Habitat Restoration, Reclamation, or Mitigation Potential.

Value Class I — Very low or essentially no potential for restoration or reclamation of the habitat to its present species composition and population levels, no alternate resource could be introduced that would be as highly valued; no acceptable options are available to compensate for the loss of this habitat, at the present time (includes stream reaches that have been designated as habitat for reintroduction of an endangered species by a National Recovery Team or State Rehabilitation Plan).

Value Class II — Low potential for restoration to present species composition and population levels; however, partial compensation options can be defined.

Value Class III — Moderate potential exists for either restoration of the habitat or reclamation to an equal or higher valued fishery, or total compensation options can be defined.

Value Class IV — Current technology makes it probable that the area can be restored or reclaimed to at least an equally valued fishery as that existing prior to development. Acceptable compensation options are likely.

APPENDIX D

The letters in this appendix contain comments on the final draft of the main body of this report. Therefore it was not possible for the report to address any of the specific issues raised in these final comments.

MONTANA POWER COMPANY
GENERAL OFFICES: 40 EAST BROADWAY, BUTTE, MONTANA 59701 • TELEPHONE 406/723-5421

November 3, 1981

Mr. Pat Graham
Chairman, Montana Fish, Wildlife, and Power Ad Hoc Committee
Montana Department of Fish, Wildlife, and Parks
P.O. Box 67
Kalispell, Montana 59901

Dear Pat,

Enclosed are The Montana Power Company's comments on the final Montana recommendations for The Fish and Wildlife Program to be submitted to the Pacific Northwest Electric Power and Conservation Planning Council. We welcome the opportunity to offer our comments for your consideration and commend the work it has taken to make this a cooperative effort. Our role in the development of recommendations has been advisary and will continue in that manner.

Although no specific recommendations have been made to modify hydroelectric operations, it is likely that such restrictions will be suggested when the proposed studies are completed. It remains to be seen if operational modifications will affect generation of power by Montana Power Company. We believe that the Regional Power Act (RPA) does not grant the Council, Bonneville Power Administration or the Federal Energy Regulatory Commission any more authority than each possessed prior to the Act's passage to impose non-power restrictions on non-federal hydro projects. Our belief arises in part from comments made on the floor of the Senate during a November 19, 1980 colloquy between Senator McClure and Senator Jackson. This legislative history is discussed in some detail in Montana Power Company's comments dated October 14, 1981 to your draft program. The essense of that colloquy was "... a federal agency cannot cite any provision of this bill (RPA) as a legal basis for proposing or imposing... a modification in any pending proceedings or in any future proceedings relating to such existing licenses." (See the Congressional Record, S14698-99 November 19, 1980.)

The production of power is the principle and intended use of the facilities licensed under the directive of the Federal Power Act and the concern for fish and wildlife cannot usurp that priority. However, fish and wildlife values are important, and have received a great deal of consideration by the Federal Energy Regulatory Commission, along with other river uses for which the project can be beneficially operated.

The document includes recommendations of the confederated Salish and Kootenai Tribes (CSKT). This is the first opportunity we have had to comment on their recommendations. We do not feel that specific comments are appropriate in this letter and we reserve the right to make specific comments at a later date. However, we do have three general comments that will be stated here:

1) We question the appropriateness of including historical and cultural comments in a fish and wildlife document.

2) There are a number of statements made that are questionable because of a lack of supporting information.

3) We agree with the approach of recognizing the economic importance of hydropower in these recommendations.

We reserve the right to comment on the General Recommendations. These recommendations are not specific and do not allow us to determine the impact they will have on our operations. We will continue to provide input as the details of these concepts may be developed, and we will continue to cooperate to meet and discuss specific ways in which these recommendations may be implemented.

We agree with the recommendations of the Montana Department of Fish, Wildlife, and Parks for the Flint Creek, Milltown, and Kerr projects. The comments that we have submitted have been incorporated into these recommendations to a large degree. We cannot agree with all the recommendations for the Thompson Falls Project. We agree with the approach of a study to determine the most feasible method of improving the fishery. But we cannot agree with the recommendations for compensation in the "off-site" section. Compensation must be based on a quantified loss and there has not been prior studies to quantify the projects' impacts. Furthermore we will not agree to open-ended compensation goals, such as a "significant river fishery" and a "significant migratory fishery". We cannot agree to preclude any streams from hydroelectric development. We feel that each project should be evaluated for its impact and that fish and wildlife concerns should be fully considered and integrated into the planning and operational process.

The Regional Power Act presents a unique opportunity to comprehensively study the ways in which the fish and wildlife resources of the Columbia River system can be protected, mitigated, and enhanced while recognizing the value and importance of a reliable hydroelectric power supply to the region. We are pleased to have been a part of this first step in this process and anticipate continued involvement.

Sincerely,

Frank J. Pickett
Sr. Biologist

FJP/ch

cc: J.A. McElwain, J.F. Walsh, L.H. Gruel, R.J. Labrie, R.L. Miller, R.T. Oleary, M.M. Ryan, D.B. Gregg

United States Department of the Interior
BUREAU OF RECLAMATION
~~WATER AND POWER RESOURCES SERVICE~~
PACIFIC NORTHWEST REGION
FEDERAL BUILDING & U.S. COURTHOUSE
BOX 043-550 WEST FORT STREET
BOISE, IDAHO 83724

IN REPLY REFER TO: PN 150
122.-

OCT 30 1981

Patrick Graham, Chairman
Montana Fish, Wildlife and Power
Ad Hoc Committee
Montana Department of Fish,
Wildlife and Parks
Region One
P.O. Box 67
Kalispell, Montana 59901

Dear Mr. Graham:

I wish to compliment you on the preparation of the Montana recommendations for a Fish and Wildlife Program for the Pacific Northwest Electric Power and Conservation Planning Council.

The government agency and public participation was outstanding. We fully endorse the concepts you have presented and the manner in which you conducted the investigations.

Although we cannot guarantee to meet all of your requests due to lack of information and various restraints on our projects, we will strive to accommodate them whenever possible.

Our final comments concerning your fish and wildlife recommendations to the Power Council are enclosed.

Sincerely yours,

John W. Keys, III

ASSISTANT Regional Director

Enclosure

HUNGRY HORSE DAM

Recommendations to Protect, Mitigate, and Enhance Fish and Wildlife Resources

Fisheries

1. Hungry Horse Dam should be operated to insure successful reproduction of kokanee in the Flathead River as follows (1.1.1):

Spawning--Flow at Columbia Falls should be not less than 4,000 ft^3/s and not more than 4,500 ft^3/s between the hours 1700 and 2400 throughout the spawning season (October-November). From 2400 to 1700 hours, the flow may exceed 4,500 ft^3/s but should never be less than 2,500 ft^3/s.

Incubation--A minimum flow of at least 2,500 ft^3/s at Columbia Falls should be maintained 24 hours per day from December 1 through March 31.

Emergence--A minimum flow of not less than 4,000 ft^3/s at Columbia Falls should be maintained 24 hours per day from April 1 until combined flows of the North and Middle Fork Flathead River exceed 4,000 ft^3/s.

During our feasibility study, programed to begin in fiscal year 1982, we will strive to formulate a plan that will provide improved fish conditions in the Flathead system and increased power generation capability at the Hungry Horse Project. Based on preliminary studies, the addition of a reregulating dam and reservoir below Hungry Horse Dam holds promise for significantly improved flow conditions in the main stem Flathead River during periods critical to kokanee reproduction and survival.

Based on a superficial examination of flow data, it looks as though the proposed spawning and emergence flows would be possible under the scenarios envisioned for future Hungry Horse operations. However, based on our previous studies, it does not appear the proposed incubation flows could be provided by the reregulating reservoir alone. Flows of this magnitude would most likely require some increase in minimum flow releases from Hungry Horse and an accompanying redistribution of flows for power generation.

Until we have better data on the reregulating reservoir capacity and have conducted more extensive operation studies, we will not know for sure what the potential and limitations of the reregulating project will be. The possibilities of providing these flows with the reregulating project alone and/or changes in the operation of Hungry Horse Project and their impact on downstream power generation will be evaluated in the feasibility study. We believe that it is appropriate to fully evaluate this operational scenario so the impacts and tradeoffs upon multiple-purpose project operations are available for use in the decisionmaking process.

2. A minimum flow of at least 2,500 ft^3/s in the Flathead River at Columbia Falls should be maintained 24 hours per day from July 1 through October 31 (1.1.2).

Although we have not had the opportunity to properly evaluate this proposal, we believe this flow could be achieved with the reregulating project without increasing minimum flows from Hungry Horse. However, operation studies are needed before we would actually know whether flows from Hungry Horse Reservoir would also be needed to meet the above recommendations.

3. Effects of amount and timing of controlled discharges from Hungry Horse Dam on distribution and migration of kokanee spawners in the Flathead River should be quantified (2.2.1).

We understand that recommendation 3 is a proposed study objective for a Bonneville Power Administration-Montana Department of Fish, Wildlife, and Parks' study contract to commence in fiscal year 1982. This study will define the significance of Flathead Lake to the overall kokanee production in Flathead basin, plus continue some Flathead River kokanee research. We support recommendation 3.

4. Construction of a kokanee spawning channel in the South Fork Flathead River should be considered (1.8.1).

It has been our understanding that the fishery values in the South Fork below Hungry Horse Dam are very low. If a spawning channel is to be considered, we believe that justification for this measure should be documented.

In our Hungry Horse feasibility study, we will be looking to a reregulating dam as the principal measure for fishery improvement. If we are to consider the spawning channel in our feasibility study, the justification for and cost effectiveness of such a facility will need to be demonstrated.

5. Critical habitat areas in North and Middle Fork Flathead River tributaries should be protected from any development that could not guarantee the project would not adversely affect gamefish rearing habitat (1.9.1).

We do not feel present or future operations at Hungry Horse Project with or without additional generating capacity will affect the preceding recommendation.

6. Drawdown of Hungry Horse Reservoir should not exceed 85 feet (1.2.1).

At present, the average drawdown of Hungry Horse Reservoir is about 80 feet. However, meeting future power loads may cause increased drawdown of the reservoir. In addition, reservoir drawdown could possibly increase to meet the previously mentioned instream flow recommendations for fishery needs. The tradeoffs of not drafting the reservoir more than 85 feet versus instream fish flow and power needs should be evaluated in the feasibility study before a decision is made regarding this proposal.

Wildlife

A study should be initiated to assess potential areas where management of wildlife could be considered as mitigation of habitat lost by construction of Hungry Horse Dam and make appropriate recommendations.

Wildlife and wildlife habitat losses associated with a reregulating dam and reservoir will be identified as a part of the feasibility study. Measures required to mitigate wildlife and/or habitat losses will be evaluated and appropriate action will be incorporated into the powerplant enlargement and reregulating reservoir plan.

Regarding the recommendations on mitigating wildlife losses from past Hungry Horse construction, we would recommend that the involved agencies meet and address the issue. In light of when the project was built, mitigation need, authority, and responsibility is in question. The recommended mitigation method of acquiring or purchasing wildlife management rights on both private and public lands has far-reaching resource management and monetary implications.

Until authority and responsibility for wildlife mitigation was determined, there would be little reason to commence with such a study as recommended.

GENERAL RECOMMENDATIONS

PROGRAM DEVELOPMENT

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3. The Council should support the development of a process that protects aquatic and wildlife resources of significant value from future hydroelectric development. This would be a form of mitigation for past development needed to establish an essential balance between rivers and reservoirs. Highest priority should go to streams that could not be adequately mitigated.

Mitigation for existing development, if not provided for in the authorizating act for that project, would appear to require legislative action. If the Northwest Power Bill provides such broad authority, thus negating the need for project-related legislation, it should be so stated. The council should take no action which would preclude the study and evaluation of a hydroelectric or other type of water resource development on a stream. It is the purpose of such studies to show alternative water uses and related cost and benefit tradeoffs both at site and cumulative. This information is then available to legislators in managing water resources in response to societal preferences.

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4. The Council should include in the fish and wildlife program a method to insure that mitigation for fish and wildlife losses is a mandatory part of the process of planning, licensing and development of projects.

Implementation of this recommendation would appear to require amendment to the Fish and Wildlife Coordination Act or a new coordination act.

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History of Wildlife Concerns, first paragraph, second sentence--"Water development projects are responsible for the loss of a large amount of riparian habitat."

This statement is somewhat misleading because of its general nature. While reservoir development in some areas causes a loss of habitat, many water development projects provide extensive wildlife habitat. Examples are Columbia Basin, Yakima, and Minidoka projects in this region which support major upland game and waterfowl populations and provide extensive hunting opportunities.

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Project design should include acquisition of lands (beyond those strictly essential to project operations) to aid in offsetting project-caused wildlife losses. These should be acquired at the same time as other project lands and be included in basic project costs. The construction agency should grant management easements or rights on these lands to the fish and wildlife agency responsible for the impacted resources and should also provide funding to permit development, operation, and management of the area for the expected life of the project.

This recommendation needs to distinguish between lands for mitigation and lands for enhancement. In the case of enhancement, the capital and annual costs of land acquisition would be cost shared under existing law. Also, any transfer of lands to fish and wildlife agencies would be in accordance with existing statutory requirement.

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Public hearings should be held to ensure that any decisions regarding acceptance or rejection of proposed recommendations to prevent or lessen project-caused impacts on wildlife are made with full public knowledge, input, and review.

Reclamation does this through the planning study formulation and workshop programs. A separate program would be duplicative and confusing to the public.

ADDITIONAL COMMENTS

Suggest adding a general recommendation that Fish and Wildlife agencies be required to identify and evaluate losses requiring mitigation to assist the action agency in formulating the most effective and cost-effective method for mitigating identified losses.

Suggest also that on existing projects that new habitat resulting from project development be compared to habitat lost, to determine the "net" loss of habitat resulting from project development that requires mitigation.

PACIFIC POWER & LIGHT COMPANY
920 S.W. SIXTH AVENUE • PORTLAND, OREGON 97204 • (503) 243-1122

October 29, 1981

Mr. Patrick Graham, Chairman
Montana Fish, Wildlife & Power
ad Hoc Committee
Region One
P. O. Box 67
Kalispell MT 59901

Dear Mr. Graham:

Pacific Power & Light Company appreciates the opportunity to participate in the preparation of Montana's Recommendations for the Fish and Wildlife Program and commends the Department for the cooperative process by which this program was developed. We regard this program as a recommendation from the State of Montana and in many respects endorse the report contents. However, we would like to address the section on General Recommendations as they pertain to hydroelectric power generation in the future and the use of existing storage reservoirs.

We recognize that the two principal storage reservoirs in Montana, Libby and Hungry Horse have multipurpose use and that part of that use is for the benefit of upstream or resident fish resources and fisheries. We believe it is appropriate to recognize the water needs for these resources in concert with the water needs for electric power, flood control and the needs for anadromous fish. A balance between uses is the logical approach.

It has been suggested that additional storage should be developed to supplement current reservoir storage for meeting the downstream water needs, particularly anadromous fish, and thereby distribute the water demand over more sources. We concur in this recommendation, but we do not have any suggestions at this time as to where such storage should be located. No doubt any new storage will incur some environmental impacts, but we believe this option should be thoroughly studied on a case by case basis to determine the overall benefits and costs.

We have no suggestions to offer concerning the state's recommendations for possible studies at Pacific Power's Big Fork hydroelectric project.

Yours sincerely,

J. A. R. Hamilton
Environmental Coordinator

JARH/ka

THE WASHINGTON WATER POWER COMPANY

Electric and Natural Gas Service

P.O. BOX 3727 • SPOKANE, WASHINGTON 99220 • (509) 489-0500

D. L. OLSON
SENIOR VICE PRESIDENT
RESOURCES

November 3, 1981

Mr. Pat Graham
Montana Department of
Fish, Wildlife, and Parks
P. O. Box 67
Kalispell, MT 59901

Dear Mr. Graham:

The Company and Montana Department of Fish, Wildlife and Parks have a long-standing record of cooperation concerning fish resources associated with Company owned and operated hydroelectric projects on the lower Clark Fork River - the Cabinet Gorge and Noxon Rapids Projects. The Company is pleased to have had this continued opportunity to work with the Department to critically review recommendations for fish and wildlife developed for the Regional Power Act. Your efforts to consult with hydroelectric project operators in this process are very much appreciated. The comments which follow are from our review of the final document, "Montana Recommendations for Fish and Wildlife".

As the recommendations document indicates, neither the Company nor the Department have been idle in concern for the fish resources of Cabinet Gorge and Noxon Rapids Projects. Unfortunately, the many man-hours and funds expended in mitigation efforts and management to improve the cold water fishery have only had short-term benefits. It appears management efforts must be redirected toward species more suited to the available habitat if benefits of a more permanent status are to be achieved. As such, the Company supports the approach of the on-site recommendation for the lower Clark Fork River fishery. Experience indicates an assessment of aquatic habitat conditions and potential methods of improvement will be a prerequisite to successful fishery management in this river area.

The on-site wildlife recommendations are not entirely acceptable as mitigation measures. The severity of wildlife impacts caused by the lower Clark Fork River projects was, in all probability, limited. However, the Company does support the intention of on-site wildlife recommendations as enhancement measures under the provisions of the Act, as appropriate circumstances are defined.

Off-site recommendations for the lower Clark Fork River projects are not endorsed by the Company. Under the terms of the Act, it seems off-site mitigation measures are to be considered only if on-site mitigation of losses is not possible. The Company would prefer all mitigative efforts to be concentrated on a project area before any off-site mitigation is considered. Further, the Act directs development of a process whereby fish and wildlife receive "equitable treatment" in energy development decisions. This provision will account for exceptional resource values of any stream. The unqualified request for 'blanket' preservation of some waterways is therefore not supported by the Company.

Off-site recommendations as well as the goal and objective statements set forth for resource improvements both neglect to identify management targets for mitigation. Phrases such as "to establish a significant/acceptable fishery", "meet public demand" or "as partial compensation for" are not absolute. How much mitigation is required to provide compensation for any given hydroelectric caused impact remains undefined for recommendations in this document. Such targets must be agreed upon prior to implementation of any mitigation measure.

Also to be established is the priority of these Montana recommendations in comparison to other concerns for fish, wildlife and power. The Act stipulates the fish and wildlife program is to be coordinated to the greatest extent possible on a system-wide basis. There will undoubtedly be areas of conflict between the fish and wildlife recommendations which must be addressed.

General and Tribal recommendations sections of the document were developed independently of the open forum critique process to which other recommendations were subject. Recommendations for other projects in the Montana document have the potential to affect Company project operations. The Company will review these and provide comment, as appropriate, to the Regional Planning Council during the developmental phase of the fish and wildlife program.

In summary, Company representatives have worked with the Department in an advisory capacity in the development of fish and wildlife recommendations. The Company supports (1) the on-site assessment approach recommended for the lower Clark Fork River fishery and (2) the intent of on-site wildlife recommendations as enhancement measures. Off-site recommendations are not endorsed. Issues not addressed in this document include establishing quantitative or qualitative mitigation targets and coordinating these recommendations on a system-wide basis. These comments have addressed sections of the document specific to the Cabinet Gorge and Noxon Rapids Projects. Comments on other recommendations will be submitted, as appropriate, to the Regional Planning Council.

Thank you again for your cooperative efforts in this matter. The Company looks forward to continued cooperative efforts during the development of the fish and wildlife program under the Regional Power Act.

Sincerely,

D. L. Olson

D. L. Olson
Senior Vice President

DLO/rdw

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX C-3755
SEATTLE, WASHINGTON 98124

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Patrick J. Graham, Chairman
Fish and Wildlife Ad Hoc Committee
Montana Department of Fish,
Wildlife and Parks
Post Office Box 67
Kalispell, Montana 59901

Dear Mr. Graham:

I have reviewed the revision of the final draft of "Montana's Recommendations for the Fish and Wildlife Program" to be submitted to the Pacific Northwest Power and Conservation Planning Council inclosed in your letter of 23 October 1981 and additional revisions received by express mail on 4 November 1981.

I support the committee's recommendations developed for Libby Dam Project and assume that opportunity for further review of the general recommendations within our area of responsibility will be accomplished by our Division office following submittal of these recommendations to the council.

We appreciate the opportunity to comment on these recommendations. Please let us know if we can be of further assistance in their development or refinement.

Sincerely,

Dwain A. Hogan

R.P. SELLEVOLD, P.E.
Chief, Engineering Division