PHASE I
WILDLIFE PROTECTION, MITIGATION, AND ENHANCEMENT PLANNING
DWORSHAK RESERVOIR

Final Report FY 1987

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Abstract

The impact to wildlife and habitat losses due to the construction and operation of Dworshak Dam on bald eagles and osprey were investigated for the 54 miles of the North Fork Clearwater River that was inundated by Dworshak Reservoir. Down stream impacts, and habitat losses due to Dworshak Dam were investigated for all target wildlife species that utilize the riparian area along the 42.5 miles of North Fork and lower Clearwater Rivers from the dam site to the confluence with the Snake River. The investigation was restricted to existing information. Changing the riverine habitat along the North Fork Clearwater River to one with unique reservoir characteristics has changed the ability of the North Fork Drainage to support past and present wildlife species that inhabited the area. The historical breeding grounds of bald eagles were reduced by increased human activities facilitated by the open access to Dworshak Reservoir and the permanent loss of historical salmon runs up the North Fork Clearwater River. The permanent loss of historical anadromous fish runs have had a negative impact on wintering eagles. The introduction of kokanee, however, has provided a replacement prey base, but only if the fishery is stable and reliable. Osprey nesting opportunities have increased and should be maintained so long as an adequate food source is maintained along with minimum disturbance. Down river impacts are unclear and little site specific information was available and it was not possible to develop a quantified impact assessment. White-tailed deer and Mule deer should not see direct loss of habitat but could be affected by restricted seasonal movements. River otter and beaver could be affected by changes in the availability of prey and den sites. The physical and chemical changes down stream from the dam may have a delayed impact on them due to changes in the fisheries, loss of den sites and increased vulnerability to predators. Canada geese and mallards will lose nest sites, due to flooding and changes in habitat as the riparian zone matures. Riparian areas on islands that were kept in an early successional stage of grasses and forbs due to scouring and flooding have changed to dense shrub and rank weeds. Great blue herons could see losses in prey base and available feeding areas due to unnatural fluctuations in water flow. Yellow warbler habitat could increase as the riparian zone matures. Impacts on Chukar and California Quail could be affected by changes in their prey base of insects, temporary loss of habitat due to flooding, and increased vulnerability to predators.

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First I would like to thank Keith Lawrence and the Nez Perce Tribe Executive Committee for giving me the opportunity to work with them in their efforts to be heard and have input into the environmental policies that have direct impact on them and the Nez Perce people. I would like to thank the Bonneville Power Administration for providing the funding to carry out this portion of the mitigation procedure. Throughout the project I have been assisted and guided by the members of the work group and have valued their input. These members are Allyn Meuleman, Vicki Saab Marks, Ted Meske, Dan Davis, Dick Moore, Dean Johnson, John McKern, Al Sutlick, Carl Christianson, Dick Geiger and Jim Kosciuk. A special thanks goes to Jerome Hanson, of IDF&G who made the coordination of the project a pleasure. Many thanks have to go to the IF&G in Lewiston and the many local residents and organizations in the lower Clearwater Valley that have been so cooperative in the information they provided and their memories of the past. A very special thanks has to go to Keith Lawrence, Jack Dell and Cheryl Eneas for all their help, support, and long hours. I finally have to thank my wife and family for giving me the love and support which is so needed in this field of endeavor.

INTRODUCTION

This report summarizes the impacts on wildlife and wildlife habitat due to the construction and operation of Dworshak Dam and Reservoir with regards to hydroelectric power generation. The study was funded by the Bonneville Power Administration (BPA) under agreement No.DE-AI79-87BP35333, Wildlife Protection, Mitigation, and Enhancement Planning for Dworshak Dam, Project No. 87-406. This project is intended to fulfill the requirements of Measures 1003 (b)(2) and (3) of the Columbia River Basin Fish and Wildlife Program adopted by the Northwest Power Planning Council for Dworshak Dam located on the North Fork of the Clearwater River in the State of Idaho.

This report is the Nez Perce Tribe's portion of concurrent studies conducted by the Nez Perce Indian Tribe and Idaho Department of Fish and Game (IDF&G). The objectives of this study were:

1. Sumarize the net effects to wildlife in the lower Clearwater River area and to bald eagles and osprey in the Dworshak Reservoir area resulting from hydroelectric development and operation of Dworshak Dam.
2. Identify the current status, management goals, and plans of target wildlife species and important wildlife habitats for the lower Clearwater River area and for bald eagles and osprey in the Dworshak Reservoir area.
3. Recommend wildlife/wildlife habitat protection, mitigation, and enhancement goals for the lower Clearwater River Area and for bald eagles and osprey in the Dworshak Reservoir area.

To help achieve these objectives, close coordination was required between the Nez Perce Tribe and IDFG. The study was also designed to include input from an Interagency Work Group. This work group met during two working sessions (July 9, 1987 and October 15, 1987) and a field trip to Dworshak Reservoir (September 1 & 2). The following agencies participated in full or in part during the work group sessions: Nez Perce Tribe, IDFG, Army Corp of Engineers (USACE) U.S. Fish and Wildlife Service (USFWS), Idaho Department of Lands (IDL), and U.S. Forest Service (USFS). The input from these agencies during the work sessions was invaluable in searching for and interpreting information found pertaining to existing populations lying within the study area.

PROJECT DESCRIPTION

Dworshak Dam and Reservoir is a multi-purpose water resource project at river mile 1.9 on the North Fork of the Clearwater River in Clearwater County, Idaho. The dam site and lower portion of the reservoir are within the Nez Perce Indian Reservation, with the entire project lying within Clearwater County, Idaho. Dworshak Dam was built under the authority of Public Law 87-874, approved October 23, 1962, Section 201 of the Flood Control Act of 1962. On September 27, 1971 the river diversion tunnel was sealed, creating the lake behind Dworshak Dam. The first hydroelectric power was delivered to BPA on March 1, 1973.

Dworshak Dam is a concrete-gravity structure rising 717 feet above the riverbed creating a long narrow lake, extending 53.6 miles up the North Fork Clearwater Canyon. The water surface area is 16,417 acres at elevation 1600 feet msl (full pool)and 9,050 acres at elevation 1445 feet msl (minimum pool). The shoreline length is 175 miles at full pool. When full, the reservoir contains 3,453,OOO acre-feet of water. The difference between full and low pool elevation is 155 feet, providing 2,000,OOO acre-feet for flood control and/or hydroelectric power generation. Initial generator installations include two 90 megawatt generators and one 200 megawatt generator with space for three 220 megawatt additional generators providing a total of 1400 megawatts of potential electrical power (USACE 1985). The dam is equipped with selector gates for selective withdrawal of water from various levels of the lake to provide temperature control of the discharge water.

Minimum discharge through the dam is 1000 CFS with a tailwater elevation of 968 ft. Maximum discharge is set at 190,000 cfs (lSO,OOO-spillway, 40,000-turbines) with a tailwater elevation of 1003 ft. Maximum river fluctuation attributable to Dworshak operation is 1 ft per hour at the Peck gaging station located at River Mile 37.4 on the main Clearwater River, 3 miles downstream from the confluence of the North Fork Clearwater River and the Middle Fork Clearwater River. Extreme daily, and monthly fluctuations (Appendix A) occur in the discharge rates from Dworshak Dam, which may be influenced by any number of reasons, such as, power generation needs, flood control, steelhead fishery needs, downstream water budget and recreation needs above and below the dam.

There are no fish passage facilities at Dworshak Dam, consequently migrations of anadromous fish (salmon and steelhead trout) are prevented from entering the North Fork Clearwater River. To mitigate for loss of passage, the largest steelhead hatchery in the world was

constructed at the confluence of the North Fork and the main Clearwater Rivers. The hatchery has a capacity to produce 3.36 million young steelhead smolts for release in order that 6,000 adults will return annually to the hatchery. Additionally, the hatchery can produce 100,000 pounds of rainbow and cutthroat trout and kokanee for reservoir stocking, providing a resident reservoir fishery.

Along with flood control and hydroelectric power generation the project provides for high and low density recreation. Recreation sites with facilities needed for R.V. camping and boating are available, along with self-contained mini-camps for remote tent camping. Log handling facilities are located at the dam site and along the upper reaches of the project. These sites provide access to the pool for lake transport of logs, for on and off project timber interests.

At the present time Dworshak Dam and Reservoir are operating under USCOE, Design Memorandum No. 26 1976, Dworshak Master Plan. This plan is being updated at the present time but has not been formally approved. (USACE pers. Commun.)

Study Area

Location

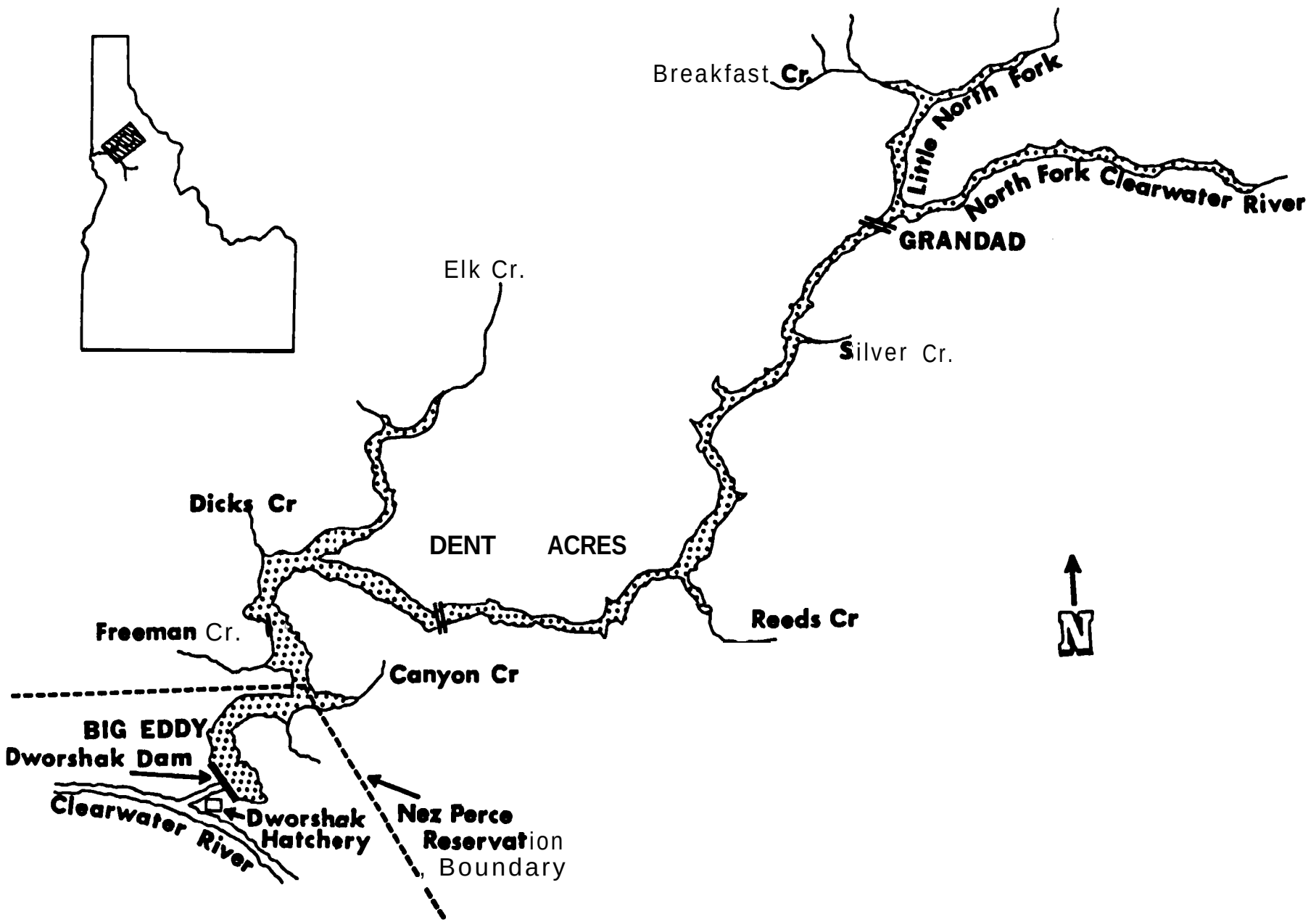
The scope of this study (project 84-406) dictated the formation of two study areas, dependent on the target species in question. The first area of responsibility in this study included Bald Eagles (*Haliaeetus leucocephalus*) and Osprey (*Pandion haliaetus*). The study area (Eagle/Osprey study area)(Fig. 1 & 2) encompasses all of the Dworshak Reservoir project area, the tailwater from the dam site to the main Clearwater and from River mile 40.6 on the main Clearwater to the confluence with the Snake River, including the Clearwater River flood plain between State Highway 12 and the Camas Prairie Railroad Line which parallels the main Clearwater for most of its length.

The second area of responsibility in this study includes the impact of hydro-electric power generation on wildlife and wildlife habitat down stream from the damsite. This study area (lower Clearwater study area) includes the 1.9 miles of tailwater, from the dam site to the confluence of the North Fork Clearwater River and from river mile 40.6 on the main Clearwater River flood plain between State Highway 12 and the Camas Prairie Railroad Line (Fig. 2).

Topography

The Clearwater River drains about 9,600 square miles of central Idaho. The upstream tributaries begin near the summits of the Bitterroot Range and flow generally westward. The eastern and major portion of the basin, including drainage basins of the principal tributaries, are rugged and densely timbered. Major tributaries are the North Fork, Lochsa River, Selway River, and South Fork Clearwater River. The western portion of the Clearwater basin consists generally of barren hills and plateaus intersected by cultivated valleys and high rolling benchlands. The lower Clearwater study area is the culmination (USACE 1975) of all the major tributaries of the Clearwater River drainage. The lower Clearwater River flows through a steep narrow canyon bordered by the drainages of ten small creeks and rivers, and numerous intermittent creeks and gulches.

The North Fork of the Clearwater River portion of the study area is typical of the upper reaches of the Clearwater Drainage. The study area is characterized by a steep, narrow canyon fed by two principle tributaries, Elk Creek and the Little North Fork, plus over 70 smaller persistant and intermittent creeks.


Breakfast Cr.
Little North Fork
North Fork Clearwater River
GRANDAD
Elk Cr.
Silver Cr.
Dicks Cr
DENT ACRES
Reeds Cr
N
Freeman Cr.
Canyon Cr
BIG EDDY
Dworshak Dam
Clearwater River
Dworshak Hatchery
Nez Perce Reservation Boundary

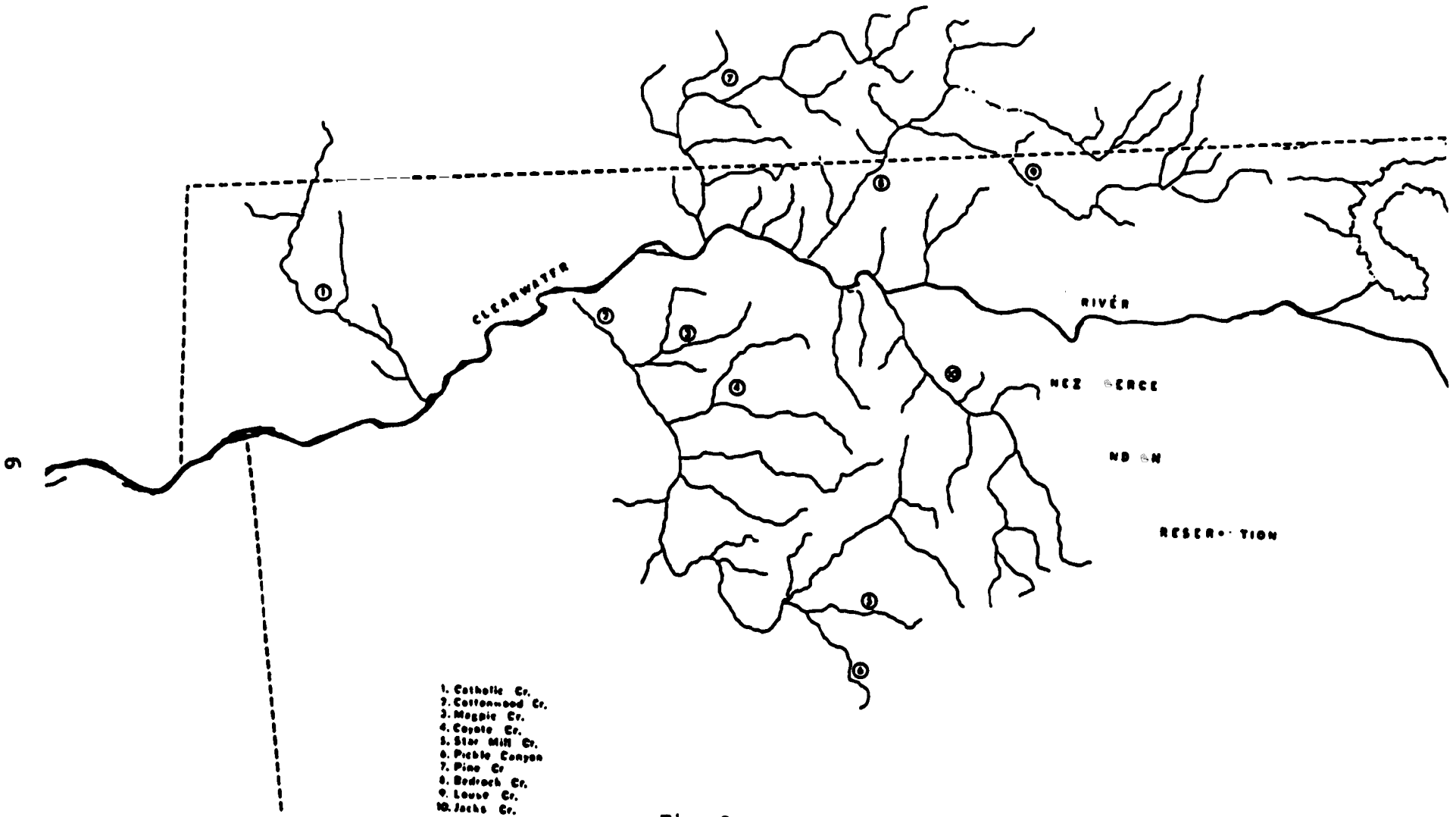


Fig. 2. Lower Clearwater River, below dam site portion of Eagle/Osprey Study Area and lower Clearwater River Study Area.

Climate

Climate in the upper Clearwater basin is characterized by mild summers and long cold winters. Snow is common from early fall through late spring. The area is dominated by moist Pacific maritime air masses moving over the area from the Pacific Ocean by prevailing westerly winds. Although these air masses have lost much of their rainfall in passing over mountains further west, they still contain sufficient moisture to yield considerable precipitation. During the winter cold polar air displaces the Pacific maritime air masses, producing clear, cold weather. Mean annual temperatures in the basin range from lesss than 32 degrees F. at highest elevations to over 50 degrees F. at lowest elevations. Seasonal temperatures indicate a fairly uniform pattern, with subfreezing temperatures occurring from October through Hay and mild temperatures being common during the summer months. The mean annual precipitation averaged over the drainage area of the North Fork Clearwater River is 51 inches but ranges from 24 inches near the river's mouth to nearly 80 inches near the summit of the Bitterroot Mountain Range. Widespread precipitation falls as a result of general storms moving eastward across the basin. In the summer, occasional thunderstorms cause intense precipitation for short periods of time over small areas of the basin (USACE 1975).

The lower Clearwater River canyon is typically hot and dry in summer with mild winters. Winter conditions in the canyon are milder than those of the adjacent uplands where snow may accumulate. Precipitation patterns are basically late fall-winter and spring. (Asherin and Orme 1978).

For the purposes of this impact statement the study areas outlined here contains all of the "primary" or "direct" effects of hydroelectric power generation on wildlife and their habitat. It is also recognized that hydroelectric generation at Dworshak Dam is woven tightly into the fabric of human activity in the region. Because of this, secondary impacts on wildlife and wildlife habitat due to activities directly facilitated by the construction of the Dworshak project will be discussed.

METHODS

At the outset of this study the Interagency Work Group selected 12 target species for study (Table 1). These target species were selected because they were of special interest and represented a cross-section of wildlife species historically important in the region or they were indicator species of the riparian habitat along the lower Clearwater River. The impact of the development and operation of Dworshak Dam on these indicator species would represent impacts on other wildlife species with similar habitat requirements.

As per the study plan, this loss assessment and evaluation was taken from existing information. Little, if any, documentation was found to exist on the target species selected for the lower Clearwater River prior to construction of Dworshak Dam. Most of the documentation found was unpublished data from IDFG and USACE. Interviews were held with pioneers who were born and raised along the North Fork of the Clearwater River and with life long residents of the lower Clearwater River. As many different contacts were made as possible to cross verify personal observations. No one source was accepted outright. Pre-construction aerial photography from 1960 along the lower Clearwater River was made available from Walla Walla Office of USACE. Total coverage of the lower Clearwater was not available. Comparisons of the large islands and some shore line riparian areas along the lower Clearwater River, were made using 1960, 1973, and 1982 aerial photographs. Using pre-and post-impoundment aerial photos, vegetation was classified into three categories (annually flooded, semi-permanent cover, permanent cover), on all islands in the river except Fir Island, for which no pre-impoundment photos were available during the report writing. Documentation on water quality and fisheries were included because of their interconnection with the food habits of river otter, bald eagles and osprey.

Table 1. Target species selected for lower Clearwater River and Dworshak Reservoir Wildlife impact studies.

Species	Reason for selection
Bald Eagle (Haliaectus leucocephalus)	Endangered spp.
Osprey (Pandion haliaetus)	Important aquatic bird of prey
White-Tailed Beer (Odocoileus virginianus)	Important big game spp.
Mule Beer (Odocoileus hemionus)	Important big game spp.
River Otter (Lutra canadensis)	Important riverine dependent, aquatic furbearer.
Beaver (Castor canadensis)	Indicator spp. for aquatic furbearer.
Canadian Goose (Branta canadensis)	Important waterfowl spp.
Mallard (Anas plalyrhynchos)	Indicator waterfowl spp.
Great Blue Heron (Ardea herodias)	Indicator spp. for shoreline and wetland habitat.
Yellow Warbler (Dendroica petechia)	Indicator spp. for shrub riparian zone.
Chuckar (Alectoris groeca)	Important upland bird spp.
California Quail (Lophprtyx californicus)	Important upland bird spp.

RESULTS AND DISCUSSIONS

Pre-Construction

Prior to the construction of Dworshak Dam, the North Fork of the Clearwater River was a naturally free flowing river. The pattern of streamflow on the lower Clearwater River was characterized by high flows during April through May or June, and receding flows in late June and July (Fig. 3). Occasionally this pattern was interrupted by high flows of short duration caused by rainstorms during the winter months. The magnitude of flows during the spring runoff season varied with the amount of snow pack, temperature and rainfall. Average annual runoff for the North Fork Clearwater River was 4,173,419 acre-feet (USACE 1975). With the Clearwater Basin having an average annual runoff of 11,240,OOO acre feet the North Fork Clearwater River contributes over 37% to the total average flow of the Clearwater Basin.

Along with the seasonal spring high water, it was not uncommon for extreme flooding conditions to occur in the North Fork and eventually the lower Clearwater River. Floods in the North Fork Clearwater River, near Ahsahka, Idaho with peak discharges in excess of 40,000 cubic feet per second (cfs), have occurred in 12 out of the 40 years of record, from 1926 to 1965 (USACE 1975). These occurred in 1928, 1932, December 1933, 1936, 1938, 1946, 1948, 1949, 1956, 1957, June 1964 and December 1964. The largest peak flood of record resulted from a prolonged rainstorm and occurred in December 1933. The December 1933 peak discharge at the Dworshak damsite, estimated at 100,000 cfs, was 50 percent larger than any other flood peak recorded. The resulting peak discharge downstream in the lower Clearwater River near Lewiston was 172,000 cfs, compared to a bankful capacity of approximately 85,000 cfs. Discharges exceeding 40,000 cfs at Dworshak damsite during this flood had a duration of about three days. The second largest flood on the North Fork measured during the 39-year existence of the Ahsahka river gauge was on 23, December 1964. The peak flow was 67,900 cfs and resulted from a three-day storm of warm rainfall which combined with melting snow. A period of severe freezing had preceded the rainstorm. The corresponding peak on the main Clearwater was 122,000 cfs. The third largest flood peak of 62,700 cfs occurred in the North Fork in April 1938 and also resulted largely from rainfall. In this case, rainfall was superimposed on the spring snowmelt. The lower Clearwater River flood peak resulting from this occurrence was 134,000 cfs. The fourth largest flood peak in the North Fork was 55,600 cfs in May 1948. The peak flow of 55,600 cfs in this flood was of greater consequence because it combined with the highest flow of

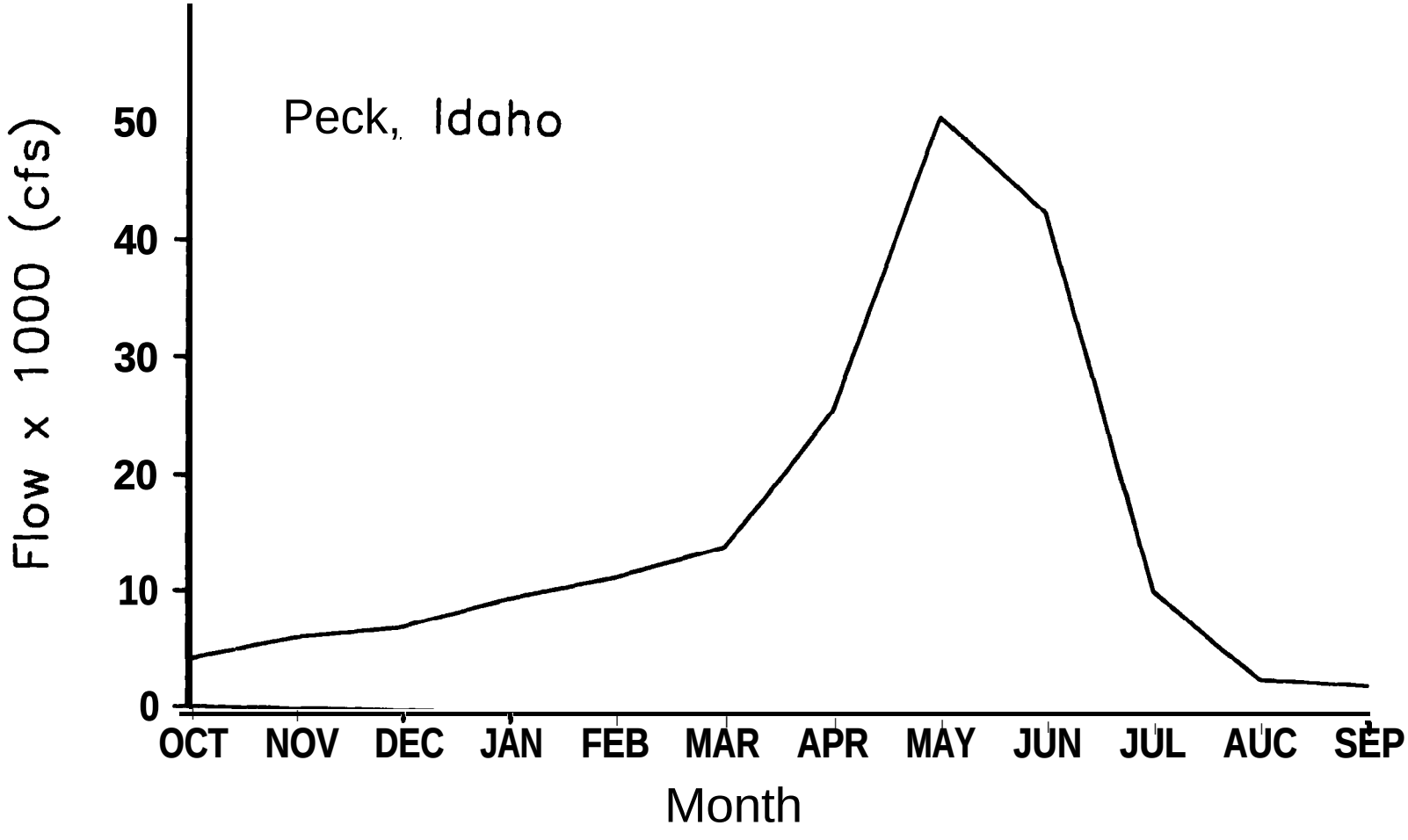


Figure 3. Mean monthly flows on the lower Clearwater River for the 10 yeors before the construction of the Dworshak Dam.

record in the upper Clearwater River and produced a flow in lower Clearwater of 177,000 cfs. Also, flows in the North Fork during this flood approximated or exceeded 40,000 cfs for a period of nine days and resulted in flows exceeding bankfull in lower Clearwater River for a period of 16 days. Complicating the flooding problem were the huge ice flows and ice jams which commonly occurred causing large blocks of river ice to be shoved up on the low flood plain areas like the Spalding Park area (Ken Steigers, pers. commn.).

Though flooding is detrimental to most of mans endeavors, floods serve a specific purpose in streams and river ecosystems. As stated by Cummins (1979) "floods excavate detritus buried in sediments, release some lodged debris jams, and capture it from the flood plain. This redistribution of organics along with displacement of periphyton are key stream ecosystem processes tied to the hydrographic regime. Although, the nature of the effects will be determined by such factors as geomorphic characteristics and severity and timing of a given storm event, floods undoubtedly represent important reset mechanisms in all stream ecosystems."

The importance of this redistribution process of organic and inorganic materials is further outlined in the River Continuum Hypothesis, proposed by R.L. Vannote, J.R. Sedell, G.W. Minshall, C.E. Cushing, and K.W. Cumins (Cumins 1979). This hypothesis embodies the concept of ecological changes as a continuous drainage basin gradient from headwaters to river mouths. A basic element of the hypothesis is the dependence of downstream communities on upstream processess. Communities in each successive stream order, from tributary to main drainage, are dependent upon the inefficiency or "leakage" from the preceding orders. This storage-cycle-release nature of open flowing water is embodied in the Nutrient Spiraling Concept proposed by J.R. Webster, R. O'Neil, J.B. Wallace, J.B. Wade, and co-workers (Cummins 1979). This cascading of nutrients, such as particulate (POM) and dissolved (DOM) organic matter, in which some is recycled and some released, is a fundamental feature of lotic ecosystems and is tied to the flow regime and the physical and chemical retention features of a given reach.

The scouring action of flood waters are important in stream channel maintenance, (Holden 1979). Maintenance of specific aguatic habitats for fish reproduction, and creation of new habitat is an important, continuely on going, process which occurs in a riverine system. This cycling and recyling in the physical attributes of the river system keeps the riparian zone in a constant form of primary succession not allowing advancement to maturity or as Baxter (1977), said "causing it (floodplain) to be

replaced by a different ecosystem maintained in a state of immaturity by the practice of agriculture".

Numerous islands, gravel and sand bars occurred throughout the length of the North Fork and lower Clearwater Rivers. Water and ice scouring kept these islands under continuous flux, which was dependent on the intensity and magnitude of the stream flow, however, fine suspended sediment was not characteristic of the Clearwater River drainage. Because of the character of the geologic formations in the drainage area, the relative scarcity of topsoils, and the nature of runoff, the suspended sediment in the Clearwater River was and still is relatively low. Physical evidence indicates there is significant movement of coarse bedload material during high flows but in general the stream is one of the lesser sediment transporting rivers in the region and therefore deserving of its name. Based on measurements of other streams in the region, it is estimated that the average annual sediment load of North Fork at the Dworshak site will be on the order of 300 acre-feet per year (USACE 1975).

The timber industry started to make it's impact felt in the North Fork area in the mid 1920's and 30's (Space 1981). Log flumes were built in the 1930's to float logs down the slopes to the North Fork where they were decked in anticipation of the spring logging drives to Lewiston, but with the advent of a more extensive road systems in the area, log flumes lost their usefulness.

In 1927, Washington Water Power built a dam across the lower Clearwater River, providing power to the Lewiston, Clarkston Valley and creating an impoundment area for log storage next to the Potlatch Mill (Nez Perce County Historical Society pers. commun.).

Prior to construction of the Lewiston Dam, there were large runs of steelhead trout and chinook salmon in the Clearwater system. Because of inadequate fish-passage facilities at this dam, salmon runs were eliminated and steelhead numbers were greatly reduced. Improvements were made to the fish ladders and experimental reintroductions of chinook salmon by Idaho Fish & Game were done in the 1940's and 50's (USFWS 1962) The Lewiston Dam was removed in early 1973 as a part of the Lower Granite Lock and Dam project on the Snake River (USACE 1975).

Along with runs of chinook and steelhead trout, the Clearwater and North Fork Clearwater river provided historical spawning habitat for chum (Oncorhvnchus keta) coho (0. kisutch) and sockeye salmon (0. nerka)(Keeler 1973). These five anadromous fisheries provided a large prey base for all fishery dependent wildlife that.

Post-Construction

From the preceding discription it follows that there is a complex intermixing of past and present human activities that have made an impact on the study area. The construction of Dworshak Dam has added yet another level of unique effects which may stand on their own or compound the magnitude of past activities.

Literally thousands of studies at all levels of complexity have been conducted on River ecology and the effects of dam construction. It seems that every aspect of impact has been studied, but out of every study there are further unanswered questions. Though a lot of information is known on the impact of dam construction, it is also recognized that each river system and project develops its own unique impacts. D.F. Haber (USACE 1979) recognized that the lower Clearwater River had many unique features that made research information, on the lower Clearwater site specific.

Along with site specific impacts, sane effects may not be evident for years after dam closure. Holden (1979) mentioned that some effects of dam construction may not appear immediately after closure, but tend to slowly appear several years later, i.e. habitat changes due to changes in flow regime. These so called delayed impacts were poorly understood and have not been well documented. These delayed impacts can also be felt over distance from damsite, as well as over time. Many of these factors operate many miles below the damsite, usually falling outside the boundaries of studies intended to delineate downstream effects.

At this point, the differentiation between the impacts on the North Fork above the damsite and the impacts in the tailwater of Dworshak and the lower Clearwater will be made. The impacts above the damsite will center on the loss of bald eagle and osprey nesting and roosting habitat, and changes that occurred affecting their prey base.

The change in the fishery on the North Fork due to the construction of the dam is a reflection of the on going processes that have occurred on and in the reservoir since it's initial filling. Because of this cause/effect relationship, a brief overview of the processes that occur when riverine habitat is changed to a reservoir/lake habitat will be made. Once a complete discription of what the impacts on the North Fork and lower Clearwater River ecosystems were, each of the target species will be addressed in terms of the positive or negative impacts the operation of Dworshak Dam has made on them.

Upstream Effects

The construction of Dworshak Dam formed a long, narrow lake 53.6 miles long inundating 16,970 acres. Vegetation consisted of open coniferous timber (7,300 acres), dense coniferous timber (6,100 acres), brush (1,190 acres), grass (510 acres), Agricultural crops (170 acres) along with 1,700 acres of water and streambed (USFWS 1962).

The open coniferous type was composed chiefly of Douglar-fir or Douglar-fir and pine associations. The dense coniferous type consisted largely of Douglas-fir and cedar-hemlock associations. Generally, the dense coniferous type was more prevalent along the south side of the North Fork, while the open coniferous type was more typical of the sunny slopes on the north side of the river. Grand fir tended to replace western hemlock, and ponderosa pine replaced white pine in the lower or more exposed sites. Where there was little or no overstory, deciduous trees, brush, and forbs assumed greater importance. A few of the drier slopes did not support trees and were covered with weeds, grasses, or shrubs, such as hawthorn and serviceberry.

Shrub species occurring in the brush and open coniferous types at low elevations were willows (Salix SP.), redstem ccanothus (Ceanothus sanguineus), mountain maple (Acer glabrum), serviceberry (Amelanchier sp.), cascara (Rhamnus sp.), elderberry (Sambucus sp.), redosier dogwood (Cornus stolonifera) rose (Rosa sp.), spirea (Spirea spp.), snowberry (Symphoricarpos sp.) oceanspray (Holodiscus sp.), thimbleberry (Rubus parviflorus), ninebark (Physocarpus sp.), and syringa (Syringa sp.). Agricultural crops consisted of small grains, hay and vegetables.

The area inundated covers the total 16,417 acres for about 2 months a year, from early July to Labor Day (USACE 1985) providing the maximum amount of recreational opportunities during the summer months. During the rest of the year, the area inundated fluctuates between full Pool (1600 ft. msl) and low pool (1445 ft. msl). At low pool the area inundated covers 9,050 acres. The eulittorial zone (area between high and low waterlines) is comprised of mud flats, benches and slopes (where erosion is not severe) and steep, highly errodable, slopes where most of the topsoil has been lost. The proportion of the 7,370 acres and the time table of inundation varies from year to year depending on the extent and speed of winter drawdown and the magnitude of the inflow during spring refill.

The construction of Dworshak Dam changed the area from a riverine habitat to a reservoir/lake habitat that

has it's own unique characteristics that can have a profound influence on the aquatic ecology of the inundated area. Because of the relationship between this aquatic habitat and eagle and osprey ecology, a brief overview of the changes in the aquatic habitat that occurred after the construction of Dworshak Dam is given.

Baxter (1977) and Langford (1983) reviewed many studies and summerized the characteristics of environmental effects of dams and impoundments. These effects are summarized as followed:

1.) A reservoir creates an extensive unstable shoreline that is most persistant. Waves, internal currents and ice scouring provide a continuous wearing action against the shoreline. Seasonal drawdowns increase the area of shoreline impacts. Erosion due to this wearing action can have a pronounced effect on sedimentation and shoreline stability. At Dworshak Reservoir, the granitic base soils that are predominant in this area are highly susceptable to surface erosion, and along with steep slopes, create ideal conditions for erosion (USACE 1975).

2.) The lake profile of a reservoir with it's deepest point at one end creates surface currents that don't dissipate against the shoreline, but may be deflected downward or reflected backward at the dam.

3.) Seismic activity may be induced by the reservoir, by providing pressure on ground water that could provide the triggering mechanism for a pre-existing force. This effect is extremely difficult to document.

4.) The reservoir acts as a sediment trap. How it's deposited depends on the characteristics of the reservoir. Sheet erosion is characteristic of stream banks, and the lands surrounding the reservoir. The amount of erosion is dependant on rainfall, slope, soil and modified by land use. Sedimentation from tributary creeks and streams cause delta formation when sediment loads drop out after hitting a large standing lake.

5.) The water entering a reservoir frequently differs from the water already present in temperature, or in content of dissolved or suspended solids, or in some combination of these, and consequently, in density. The incoming water does not then mix immediately with the water of the reservoir, but moves downstream and laterally above, below, or within it, as an overflow, underflow, or interflow. Such flows are referred to as density currents. Inflowing water which owes it's greater density in whole or in part to suspended material are called turbitity currents. Turbitity currents can carry a sediment load far into the reservoir contributing to the formation of bottomset deposits. During high flows at Dworshak, water entering the lake is quite turbid (USACE

1975). As the dam releases the flows over a period of time, this silt-bearing water is released over a longer period than it was prior to the impoundment. Thus turbidity is present downstream in the lower Clearwater River for a longer period of time each year, as releases are made at the dam.

6.) The chemical composition of water in new impoundments is influenced by the chemistry of inflows, precipitation, leaching of soils and decomposition of vegetation inundated by the reservoir. The flooding of previously dry ground may lead to the release into the water of toxic substances, there either naturally or as a result of human activity. The alteration of the pattern of erosion and sedimentation may lead to the release of pollutants which are known to accumulate in sediments. The decomposition of submerged vegetation often leads to a depletion of oxygen in the depths of the reservoir. Dworshak reservoir is a cold, nutrient-poor body of water with low biological productivity (USACE 1982). Dworshak's reservoir morphology (depth, low surface to volume ratio) and low watershed nutrient contribution are the primary factors influencing its water quality. Deoxygenated water and hydrogen sulfide were found at the lower reaches of Dworshak Reservoir soon after its closure but due to the relatively small amount of deoxygenation water, it wasn't expected to exert a significant **oxygen** demand on the upper waters when mixing did occur (USACE 1975). Should hydrogen sulfide form, it would most likely fall below the 259 ft. mark, which is the lowest point that outflow water can be taken at Dworshak.

7). Thermal-stratification is also a characteristic of reservoirs. A graph showing the generalized temperature profile in Dworshak Reservoir shows the process of stratification starting in Hay, being fully stratified in August, then with the fall turn over, the lack of stratification during the late fall and winter (Fig.4) (USACE 1975). This is different than the seasonal fluctuations (Fig.S)(USACE 1975) that occurred in the North Fork prior to impoundment. It would reduce the annual range of O-23 C to 4-8 C in the deeper parts of the reservoir. Near-shore and inshore temperatures may continue to approximate those of the river before impoundment, but there is little doubt that the original fauna of the main river channel would experience dramatic changes in temperature, i.e. warmer in winter and colder in summer. Mean temperature of the reservoir water has been gradually cooling since closure (USACE 1975).

8.) The seasonal drawdown and refilling of the reservoir has an impact on the littorial regions of the reservoir and the benthic organisms that occupy the area.

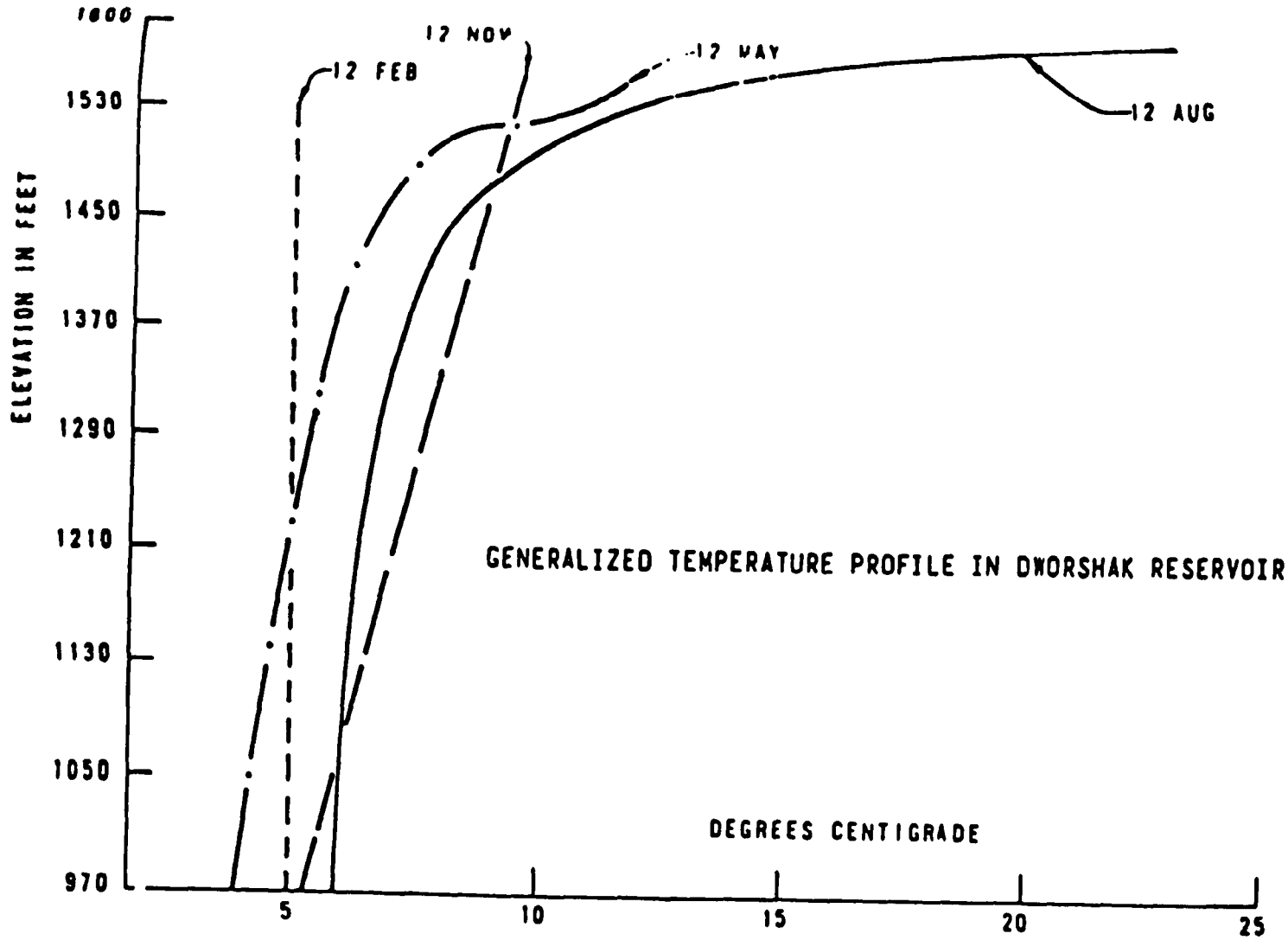


Fig. 4. Generalized temperature profile in Dworshak Reservoir. (Taken from USACE-Final EIS. 1975).

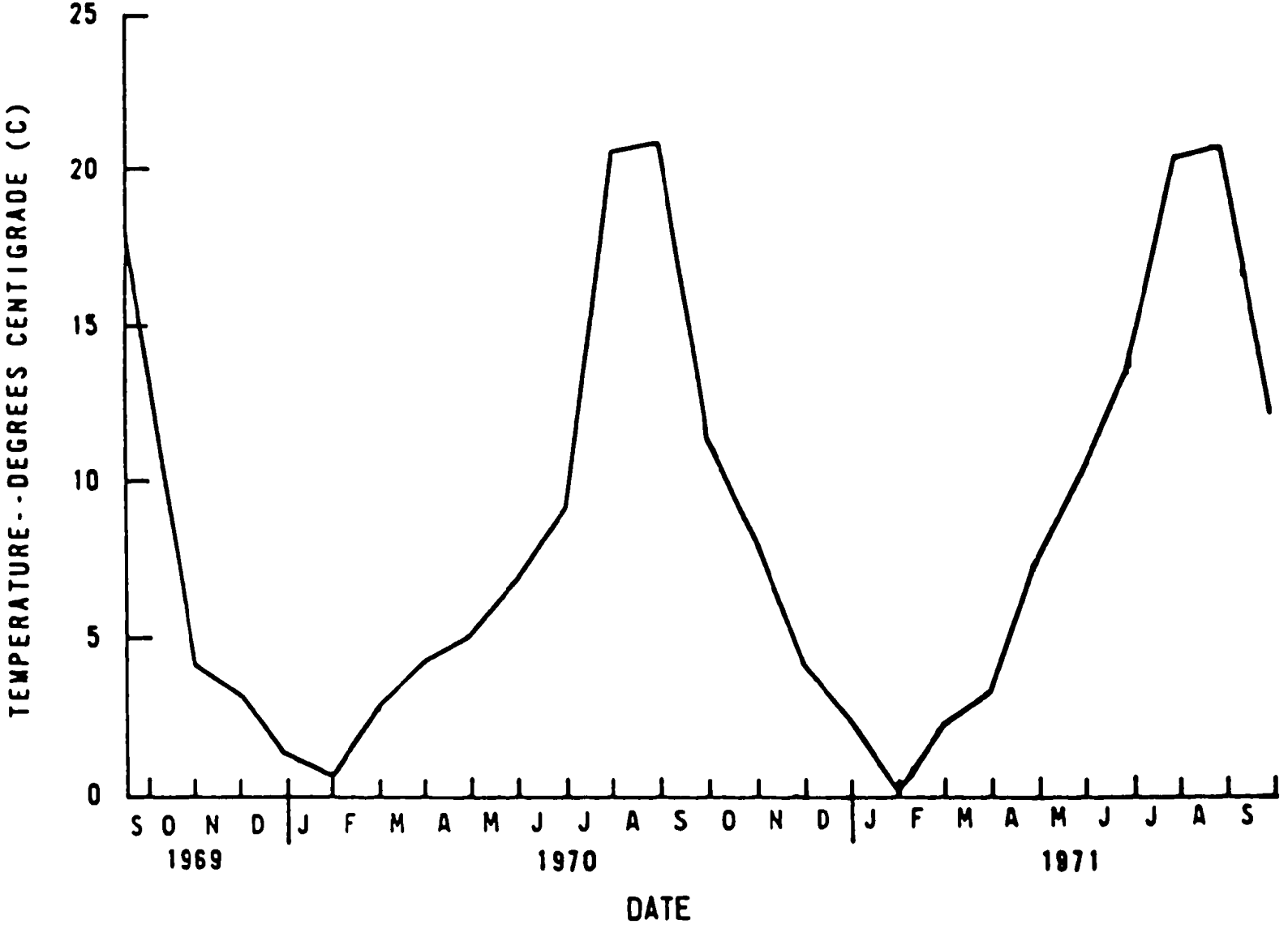


Fig. 5. Typical temperature pattern, North Fork Clearwater River, (RM 12.5), prior to Reservoir impoundment. (Taken from USACE-Final EIS. 1975).

Drawdowns in general, cause much greater fluctuations in substrata temperature than would naturally occur. Drawdown can cause dessication of the exposed soils and in the case of winter drawdowns, like Dworshak, substrates can be frozen at some depth. The pulse-stabilized communities that have developed on natural lakes are different than what is seen in the drawdown zone of reservoir. The unnatural regime stabilizes an ecosystem at a degree of immaturity which in high latitudes can amount to barrenness. At Dworshak these exposed banks are quickly invaded with plants, mostly annual forbs and grass. Asherin and Orme (1978) found that some plants germinate and initiate growth in the fall as soon as the banks become exposed; however, the peak in plant development on the banks occurred in the early spring due to the ideal growing conditions - especially on southerly exposures. During the spring and summer of 1977 they identified 5 grasses, 36 forbs and 3 shrub species. Aguatic macrophytes are virtually nonexistent in the North Fork system (Asherin and Orme 1978).

9) Lacustrinization results in the elimination of the riverine benthic algae mainly as a result of reduced light penetration, reduced gas exchange, and increased sediment deposition. Algae production is limited to the photic zones - the epilimnion, the littoral, and sub-littoral zones, depending on turbidity. A permanent phytoplankton developes in most reservoirs where the retention of water is of sufficient duration. Blue green algae blooms occur on Dworshak on occasion if nitrogen and phosphorous levels are sufficient.

10) Where a fast flowing river is impounded the reduction of light penetration, sedimentation, and the chemical changes in deep water would be expected to eliminate all those macrophytes specifically adapted for the original riverine habitat. The development of a "rooted" macro-flora after impoundment depends on water chemistry, light penetration, shore erosion, and the extent of drawdown. Where drawdown is extensive and prolonged any rooted aquatic plants grwing in the littoral zone are eliminated, either by heating and desiccation in summer, or freezing and desiccation in winter. Aquatic macrophytes in the North Fork System are non-existent (USACE 1982).

11) The flooding of a riverbed upstream of a dam eliminates most of the obligatory "fast water" macro-invertibrates species of the original riverbed because of silt deposition and changes in dissolved gases.

The construction of Dworshak eliminated the anadromous steelhead trout and chinook salmon from the North Fork Clearwater Drainage. Just prior to construction approximately 10,000 steelhead per year 30%

of the Clearwater River run, migrated up the North Fork (USACE 1975). Due to a reestablished run in the early 1960's, chinook salmon were spawning in the North Fork prior to construction.

The filling of Dworshak Reservoir changed the fishery from a lotic situation to a lentic or slackwater fishery. Fish species present in the North Fork during its preimpoundment era included steelhead, rainbow trout, Dolly Varden, cutthroat and brook trout, chinook salmon, brown bullhead, small mouth bass, mountain whitefish, longnose dace, sculpin, redside shiner, northern squawfish, speckled dace, chiselmouth, largescale sucker, bridgelipsucker and Pacific lamprey (USACE 1975). Game fish of importance found in Dworshak now are Kokanee (landlocked sockeye salmon), rainbow trout, cutthroat trout, Dolly Varden, smallmouth bass and largemouth (USACE 1985). Kokanee, rainbow trout and smallmouth bass have all been stocked as an introduced species or in addition to the wild stock (USFWS 1980). The USFWS (1962) stated that there would be practically no trout reproduction in the reservoir proper; however, some spawning areas for resident fish would be available in streams tributary to the reservoir. Nongame fish would thrive, and after a few years, would predominate in the reservoir. At this time there has not been any completed population studies on non-game fish at Dworshak Reservoir.

Upon the completion of Dworshak Dam, impact from increased access, thus human activity has been facilitated by the construction of Dworshak Reservoir. The USACE (1985) (Table 2) listed the classified areas and their acreages designated for project operations, log handling facilities and recreation use. Areas designated for wildlife, natural areas and National Forest lands are also listed along with the list (Appendix B.l) of descriptive criteria and conditions pertaining to each category of land use. This classification and acreages are preliminary at this time.

Table 2. Land Use classification acreages. A summary of Table 14, USACE's preliminary Master Plan (USACE, 1985)

Classification	Acres
Project Operations	298.8
Log handling	183.9
Log Handling Future	10.7
Recreation High Density	1,245.7
Recreation High Density Future	1,120.8
Recreation Low Density	4,083.l
Wildlife Mgt. Intensive	11,643.l
Wildlife Mgt. Moderate	9.749.4
Natural Arca	982.5
National Forest Land	1,617.4
	30,935.4

Downstream Effects

The impact Dworshak Dam has had on the riparian zone along the North Fork and lower Clearwater Rivers and thus, the wildlife that inhabits this area will revolve around the changes in flow regime, temperature changes, and water quality. The total impact of changed flow rates and water quality will be modified, on the lower Clearwater, by the fact that the North Fork Clearwater River flows into the main Clearwater 1.9 miles downstream from the damsite. The fact that the North Fork Clearwater River comprises about one-third of the total flow in the lower Clearwater was one of the factors Haber (USACE 1979) pointed out as important in the site specificity of information about downstream hydro-electric impacts at Dworshak Dam.

Seasonal changes in average monthly flow rates along the lower Clearwater, pre-and post-construction, are seen in Fig 6. The average spring peak flow was delayed one month (from May to June) and reduced in intensity from 51,600 cfs to 40,300 cfs (Table 3) post-construction. The reduced flows, however, only occur in April, May and June. For the rest of the year, post-construction flows at the Peck, Idaho gauging station, about 5 miles downstream of the North Fork confluence, ran higher than pre-construction flows.

Along with a shift in the timing of the flows and the dampening of seasonal variance in flow volume, a dramatic change is seen in daily fluctuations of the 1.9 miles of tailwater and, subsequently, on the lower Clearwater. Flow records for Dworshak Dam over the past two years, 1986 and 1987, show flow rates dropping from, 25,000 to 1,000 cfs in less than 24 hours and rising, from 2,100 to 20,000 cfs within a 24 hour period (Fig. 7). These particular events occurred within 10 days of each other in May, 1987. However, some months have no daily variations at all.

The impact these daily fluctuations have on the flow rates along the lower Clearwater is modulated by the flows from the Middle Fork of the Clearwater. This is evident by looking at the flow heights during the week following the dramatic drop on May 18, 1987, (Fig 8). After a change of 5.2 ft. on May 18, 1987, the flow heights changed 1.8 ft. with no change of flow rates at Dworshak.

The impact of flow fluctuations along the lower Clearwater starts with primary production. Haber (USACE 1979) felt that conclusions from similar studies stress the importance of isolating impacts on the lwest level of the food chain as higher levels will be influenced in time. Kroger (1972) stated that a reduction in primary production caused by flow fluctuations is inherently detrimental to the production of sport fish. There have

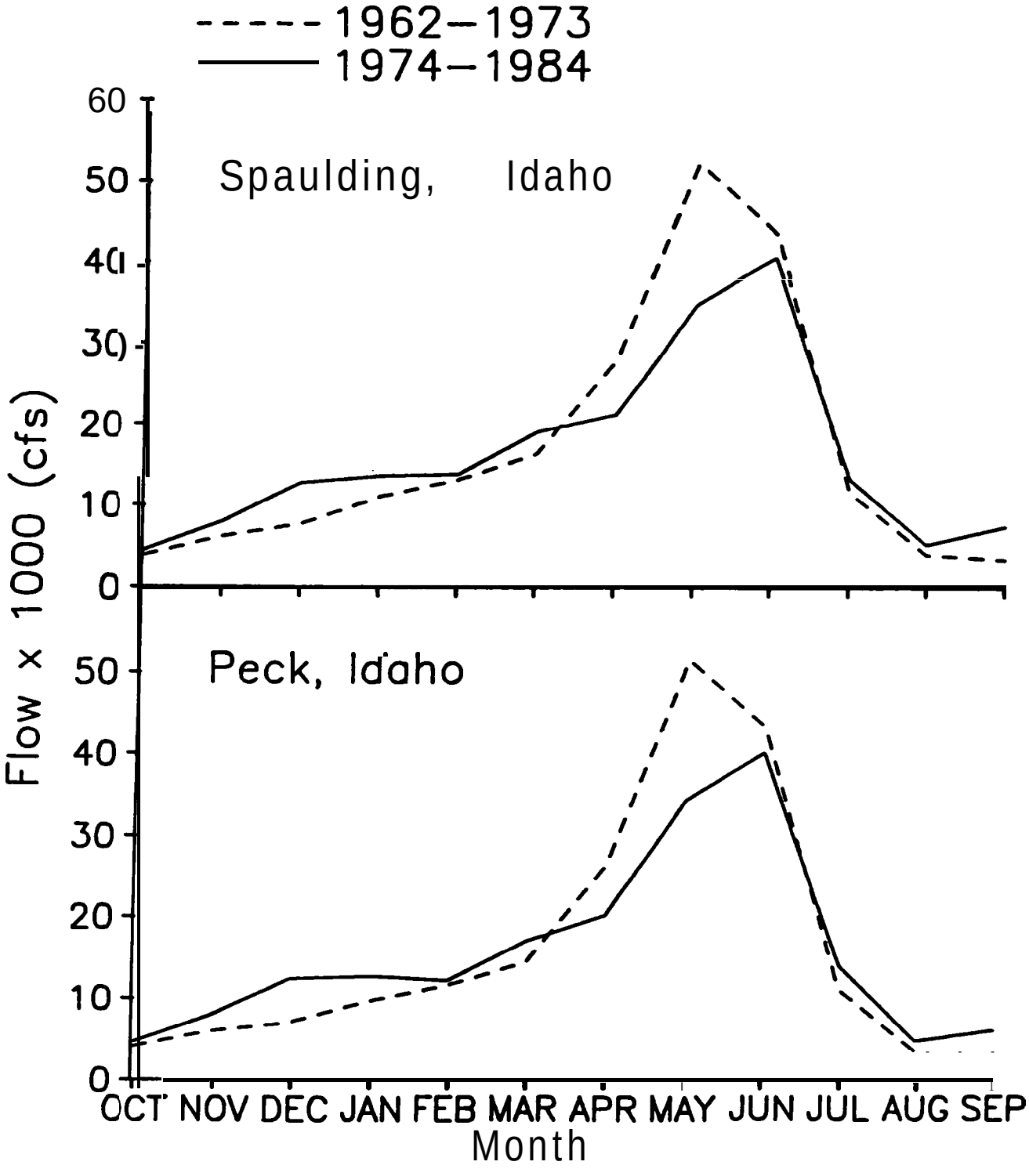


Figure 6. Mean monthly flows on the lower Clearwater River for the 10 years before and after the construction of the Dworshak Dam.

Table 3. Mean Monthly flows on the Clearwater River at the Spaulding and Peck, Idaho gaging stations comparing flows before and after the construction of **Dworshak Dam.** The percentage percentage difference is based on the pre-construction flow values.

Month	Flow x 1000 (cfs) at Peck, Idaho 1962-1972	1973-1984	% Difference	Flow x 1000 (cfs) at Spaulding, Idaho 1962-1972	1973-1984	% Difference
October	4.2	4.8	14.3	**3.9**	**4.5**	15.4
November	6.2	8.1	30.6	6.2	**8.0**	29.0
December	7.2	12.5	73.6	7.7	12.8	66.2
January	9.8	12.8	30.6	11.1	13.7	23.4
Febuary	11.8	12.3	**4.2**	13.2	13.9	5.3
March	14.6	17.2	**17.8**	16.4	19.1	16.5
April	26.5	20.4	-23.0	28.1	21.3	-24.2
May	51.6	34.5	-33.1	52.0	34.8	-33.1
June	43.5	40.3	-7.4	43.5	40.4	-7.1
July	11.4	14.2	24.6	11.6	13.2	13.8
August	3.9	**5.2**	33.3	4.0	5.2	30.0
September	3.5	**6.6**	88.6	3.4	7.4	117.6

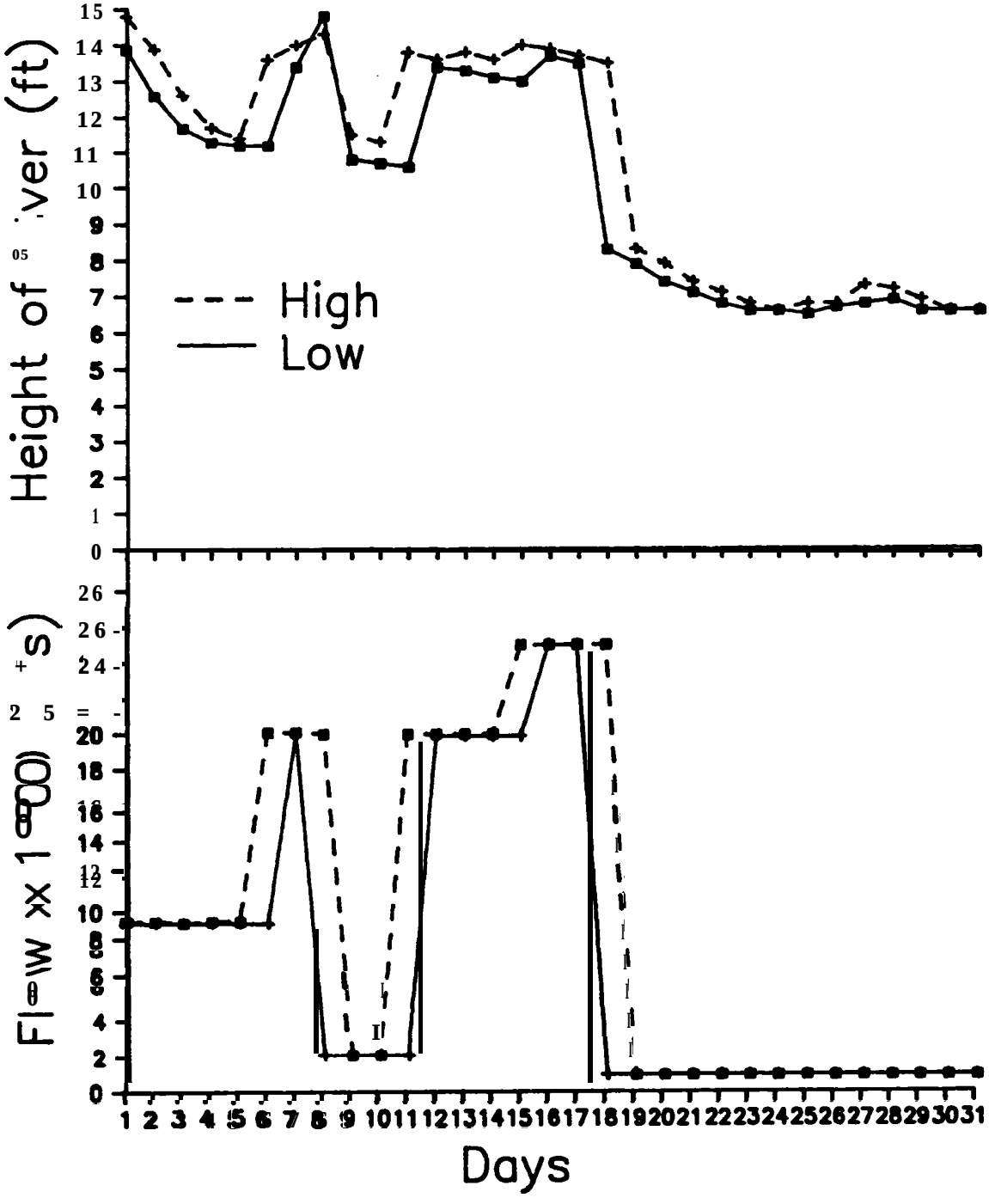


Figure 7. High and low flows from Dworshak Dam and the height of the Clearwater River at Peck, Idaho during May 1987.

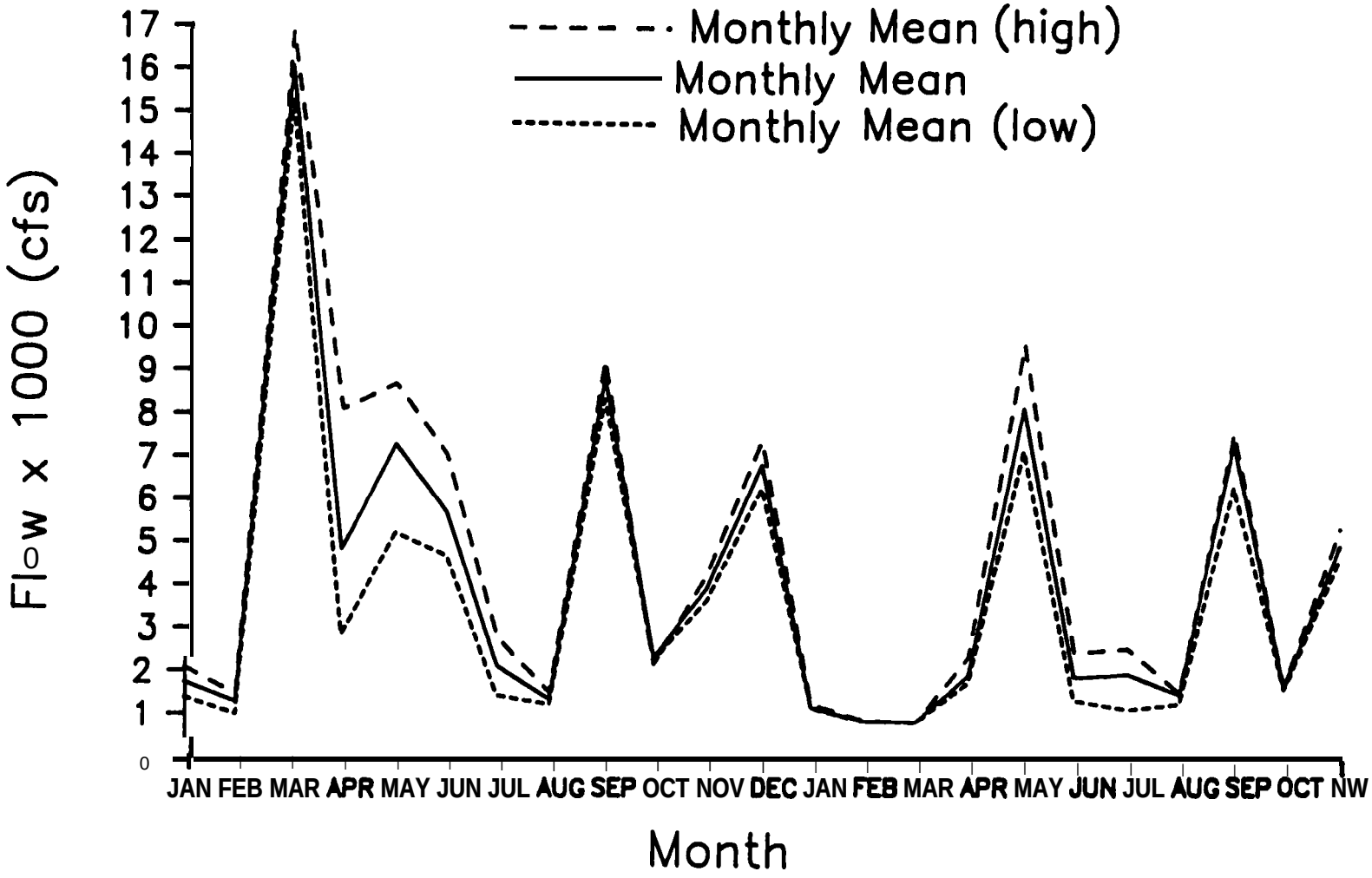


Figure 8. Mean monthly flows from Dwoshak Dam from January 1986 to November 1987.

been no indepth studies at the primary producer level along the lower Clearwater.

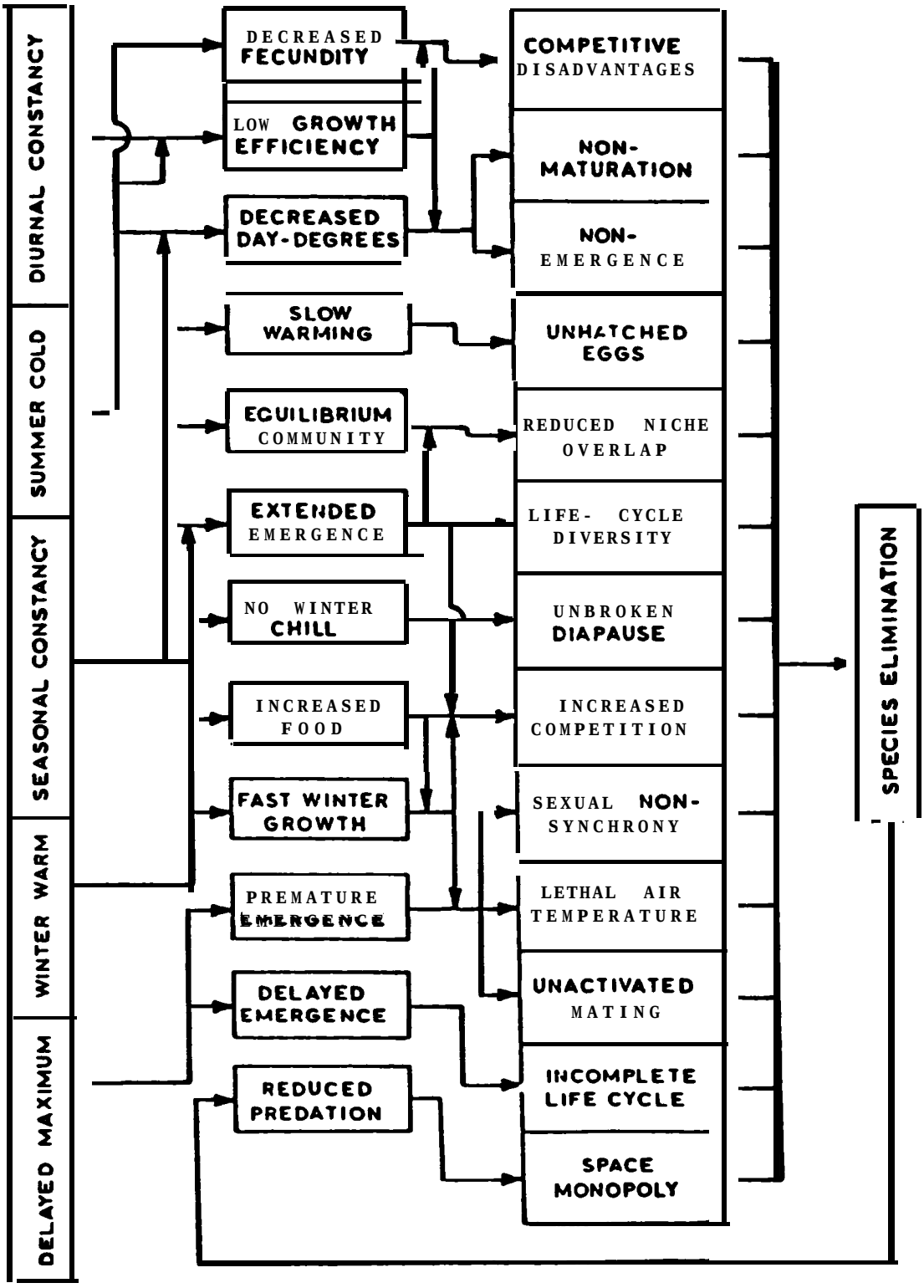
Benthic insects are another level in the aquatic food chain that are affected by flow fluctuations. MacPhee and Brusven's (1976) study on the lower Clearwater found the benthic insect community below Dworshak Dam has remained relatively stable during and after the filling of Dworshak Dam but shorelines experiencing daily fluctuations are not readily colonized by stoneflies, mayflies and Caddisflies; chironomied midges were the most resilient stranded insects in these unstable areas and the first ones to recolonize the flooded area. Stanton (1977) found decreases in insect density on shoreline substrate that is subjected to daily dewatering because drifting insects do not readily colonize these areas. In contrast to the zone of fluctuation along the lower Clearwater, Brusven and Trihey (1978) stated that due to the higher, stable post-project flow, additional substrate is guaranteed during naturally low-flows in later summer which increases macrobenthic habitat overall.

Seasonal water temperature changes are significant to the benthic insect community by influencing benthic life cycle events (Black 1977). Departures from normal, seasonal temperatures are potentially detrimental. The outflow from Dworshak Dam has changed the temperature regime of the lower Clearwater so it is now warmer in winter and cooler in the summer (USACE 1975). Stanton (1977) found a decrease of 2 - 3 C in summer temperatures and 1 - 3 C in winter temperatures at Peck. The temperature change in the tailwater area of the North Fork and the lower Clearwater River keeps the lower Clearwater River ice free all winter. The operation of the selector gates and the water demands of Dworshak Fish Hatchery influence the specific water temperature releases.

The change from a low flow, potentially ice-covered river to a stable ice free river leads to increased densities of benthic algae and changes the structure of the community (Lowe 1979). Ward (1976) found epilethic standing crops 3-20 times greater in the regulated portion of the stream. Ward and Stanford (1979) summarizes possible effects on the zoobenthic community (Fig 9). Brusven and Trihey (1978) stated that the effect of lower water temperatures on benthos metabolism and emergence, on the lower Clearwater has yet to be identified.

The combined affect of an ice free lower Clearwater, controlled flooding, and diurnal fluctuations has changed the serial stage of the riparian zone along the lower Clearwater River from a perpetually fluctuating, immature habitat to one that is slowly becoming more mature and less dynamic. A series of aerial photos were examined to determine if a change could be seen in the structure and

ECOLOGICAL FACTORS CONTROLLING STREAM ZOOBENTHOS



coverage of the riparian zone along the lower Clearwater. Black and White aerial photos, provided by the USACE, from 1960 and 1973 were used along with 1982 colored photos, provided by the Northern Idaho Agency of the Bureau of Indian Affairs, Lapwai, Idaho. Because of the very narrow limits of the riparian zone along the lower Clearwater and the overlapping effects of rip rap, along the lower Clearwater River corridor, islands, as distinguished on the 1960 aerials, and low lying **areas,** that were easily distinguished were used to measure physical changes in the riparian zone. Complete coverage of the lower Clearwater River in the 1960 series was not available at this draft.

An increase in total area, from 255.01 acres to 275.52 acres was **seen** between 1960 and 1973, where as a change of only 1.92 acres occurred from 1973 to 1982 (Fig 10)(Appendix C). This indicates a significant amount of substrate movement and deposition between 1960 and 1973. The fact that the flow rates during both aerial series' were the same reinforces this. In the low lying area a small change in flow rate can rapidly change the amount of dewatered shoreline. The difference in flow rates from 1973 and 1982 photo series was 410 **cfs,** which counted for only 1.92 acres difference overall. In 1960, all study sites had bare areas ranging from 26% to 100% bare substrate with 5 study sites having 100% bare substrate. In 1973, all but 1 study site had bare substrate, ranging from 9% to 100%, 4 areas bearing 100% bare. In 1982, all but 2 sites have bare substrate, ranging from 5% to 100% with only 1 area at 100% bare. **A** shift in the percentage of the area that was bare (no vegetation) to that of low cover (areas that have a varying amount of vegetation and is persistently inundated) was seen for all study sites between 1973 and 1982.

All of this shows the stabilizing effect on low lying areas and islands, that Dworshak Dam has had along the lower Clearwater. Vegetation types identified by Asherin and Orme (1978) that were found in these areas that are vegetated, but perpetually inundated, were annual forbs, grasses, and macrophyllous shrubs and vines (Coyote Willow).

Changes in species composition can also be expected. Species that were tolerent of flow fluctuation would either increase or stay the same. Others would likely decrease. Tabor et al (USACE 1981) found just these results in a study of water fluctuations along the Columbia River. Three species of trees, 8 shrubs, 9 perennial grasses, 17 perennial forbs and 14 annual were predicted to decline while no trees, 5 shrubs, 10 perennial grasses, 18 perennial forbs and 9 annuals were predicted to increase. The remaining 57 species of tree,

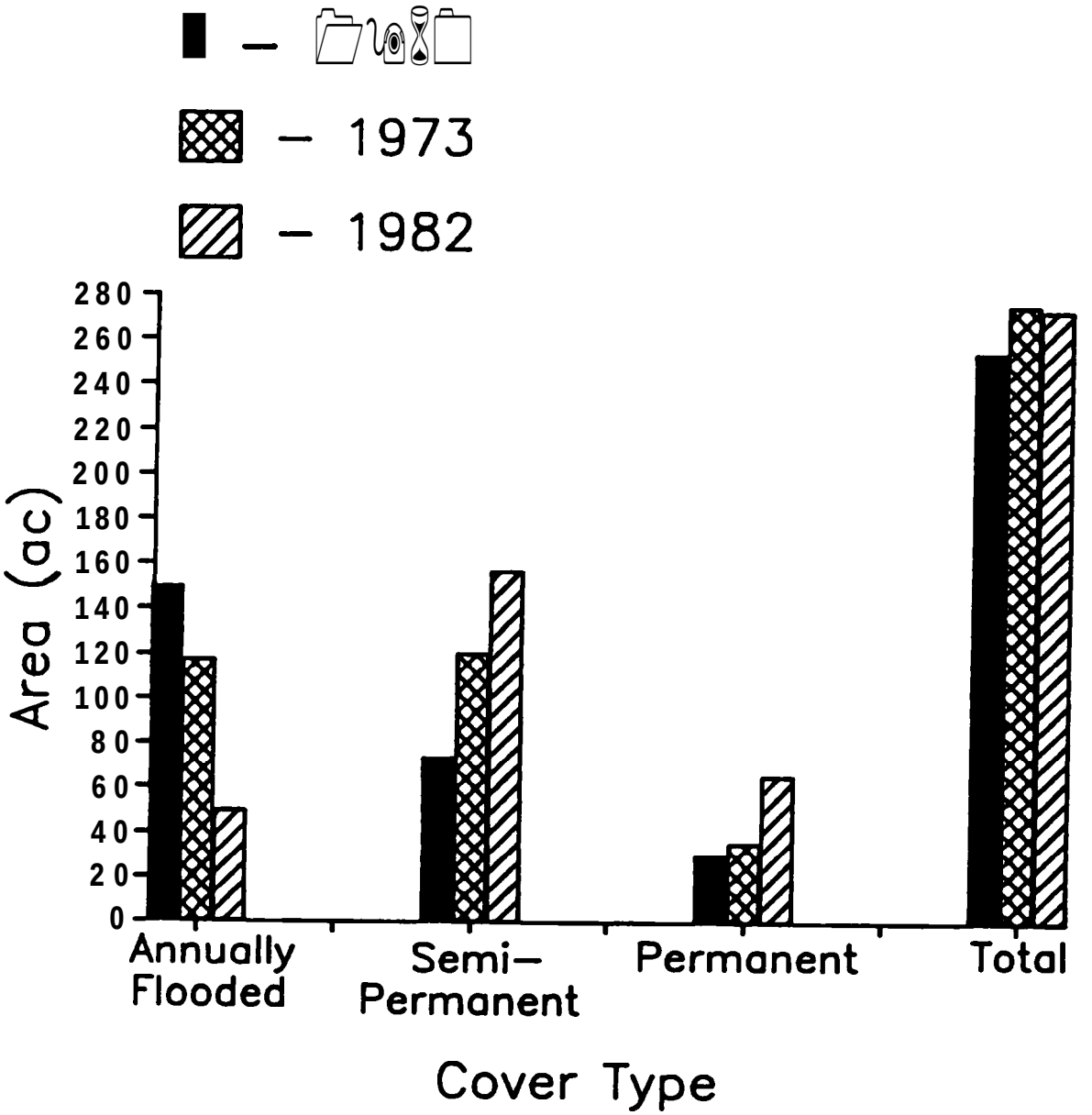


Figure 10 Comparison of the total area covered by 3 cover types on islands in the lower Clearwater River based on aerial photographs taken in 1960, 1973, and 1982.

shrubs, forbs and grasses would remain unchanged or there was insufficient data to make a prediction.

Changes in the fisheries is usually tied to habitat alteration, flow rates, prey availability and water quality. Holden (1979) pointed out whether a factor is immediate or delayed, the ultimate impact of regulation on obligate riverine fishes depends on the degree of change and the tolerance level of the fish to that change. Immediate impacts to the downstream fishery can be caused by fluctuating flows which can reduce available habitat for spawning and dewater spawning nests. Temperature changes can have a negative effect on reproductive success for fish that are not tolerant to the change. Water chemistry in the tailwater is a reflection of the outflow from the damsite. Gas bubble-disease and gas-supersatuation can also have a significant impact on a downstream fishery. Holden (1979) also presented an hypothesis that the loss of high spring flows, which are needed for scouring and channel maintenance, may be especially important in maintaining fish habitat. He suggests that reduced flows in some areas may reduce the braidedness of a channel, but perhaps increase it in other situations thus changing the type and quality of fish habitat.

Pettit (1976) wrote an evaluation of the game and rough fish population below Dworshak Dam following a 7 year fisheries study covering 3 years pre-impoundment and 4 years post-impoundment. A summary of this is as follows; Water releases from Dworshak Darn cooled the lower Clearwater River in summer and warmed it during winter in 1973 and 1974. In the fall of 1974, multilevel selector gates were put into operation and as a result the temperature differences between North Fork and main Clearwater River was significantly reduced. However, the post-impoundment temperatures in the lower Clearwater River still remained somewhat warmer in the winter and are depressed during the summer.

The aging process of Dworshak Reservoir and its trend towards oligotrophy have significantly altered the water chemistry in the North Fork below the dam. Postimpoundment values for total hardness and alkaiinity have shown a downward trend.

The operation of Dworshak Reservoir for water storage and power production has altered natural flows in the lower Clearwater River during the entire year.

The Clearwater River smallmouth bass fishery has been reduced to a remnant of its former preimpoundment level. The bass harvest in 1969 was estimated at 6,782 fish and had dropped to less than 500 by 1973. Cooler summer water temperatures and fluctuating flows have greatly limited spawning opportunities. Removal of the Washington Water

Power Dam also destroyed rearing and spawning habitat in the lower section of the river.

Cooler summer temperatures have provided an ideal trout habitat below the North Fork. Transects run in August and September of 1975, showed suckers well distributed over the length of the lower Clearwater with other numbers of non game fish too low to determine their distribution.

TARGET SPECIES

Bald Eagle

Pre-Construction conditions

Documentation of nesting bald eagles in the North Fork Clearwater and lower Clearwater Drainages during the pre-construction era is very spotty at best. Hand (1941) reported a bald eagle nesting along the Little North Fork of the Clearwater River in 1930 and 1931. Alfred Jenks (pers. conmun.) a life long resident in the North Fork area who was born and raised just above Elk Creek, remembers seeing bald eagles frequently, searching for prey in the North Fork. This was during the 1920's and 1930's. He stated that most of the eagles remained upstream, above the Dent Bridge area. Frank and Jake Altmiller (pers. commun.), two brothers that were life long residents in the Elk Creek area of the North Fork, remember bald eagles up along the North Fork but both remember them as uncommon. Rich Howard (pers. commun.), Wildlife Biologist, U.S.F.W.S, Boise, ID, stated that he felt the North Fork drainage was never an area of high value to nesting bald eagles due to the nature of the confined narrow canyon, that's characteristic of much of the drainage.

Wintering bald eagles were more evident in the study area due to their concentration in areas of abundant food. Alfred Jenks, again recalled eagles feeding on the carcasses of spawned out salmon stuck in the ice along the North Fork. Mr. Jenks recalled that, along with the huge runs of salmon up the North Fork, there were an abundance of eagles in the area.

On the Lower Clearwater, Andy Eatmon, (pers. commun.) a former government trapper, and long time resident of Lewiston, ID, recalls bald eagles wintering in the Lewiston area, in and around the Washington Water Power Dam in Lewiston. The eagles fed on fish and waterfowl that gathered around the dam site.

Post-construction conditions

At the present time, there are no documented sightings of nesting bald eagles within the bald eagle/osprey study area. An undocumented sighting was seen in the Dent Bridge Area, on the reservoir, by Pete Black (pers. commun.), a forester for the Nez Perce Indian Tribe. He recalls seeing a pair of bald eagles in the spring just below the Dent Bridge several years after the filling of the reservoir. Johnson and Melguist (1973) mentions a nesting pair of bald eagles on the Kelly Creek Ranger District in the upper reaches of the North Fork system.

During the first winter of project operation, erratic ice formation caused a number of deer and elk to break through and drown (USACE 1975). When ice was solid enough to support their weight, white-tailed deer were being chased out on the ice by coyotes, or if they had already wondered out on the ice, they became more vulnerable to predation. Bald eagles were observed feeding on the carcasses of coyote kills and drown deer,(Andy Eaton, pers. commun.).

Kokanee have been heavily stocked in Dworshak Reservoir since 1972 (USFWS 1980). Bald eagles have concentrated near the damsite during most winters in response to the discharge of kokanee through the dam, making them available to the wintering eagles. In Asherin and Orme's study (1978) 3 eagles were observed during January and February of 1976. On February 20, 1976, the regulating gates were opened to lower the pool levels, which resulted in an increase to a high of 19 eagles observed by Corps personnel. By the last week in March, most of the eagles appeared to have left the study area. Observations during the 1976-1977 winter season recorded a high of 10 bald eagles present on the reservoir. A high of 3 eagles were seen along the lower Clearwater. River mile 17.2 was the farthest downstream that the eagles were seen. There was no observed buildup below the dam during the 1976-1977 winter season. Eagles have been seen on Fir Island river mile (RM) 22 by local residents nearly every year (Ken Steigers, pers. conmun.). Counts of bald eagles in the immediate area were conducted by the Corps. of Engineers during the winter of 1979 through 1987, as part of the National Wildlife Federation Midwinter Bald Eagle Survey (USACE 1985). Eagle counts ranged from a low of 11 in 1980 to a high of 29 in 1981.

In recent years, eagles have been spotted over the entire length of the lower Clearwater River (NPT pers. commun.). Eagles have also been observed feeding on carrion up on the agricultural fields of the prairie, south of the lower Clearwater River (Keith Lawrence pers. commun.)

Impact assessment

The impact of the construction of Dworshak Dam and hydroelectric power generation on the breeding population of bald eagles in the study area is clouded by mitigating circumstances. The evidence of breeding bald eagles in the study area shows that eagles were present in the upper reaches of the study area under pristine river conditions that were evident during the 1920's and 1930's. With the increase in logging activity and logging drives, which are known as an activity that is disruptive of breeding eagles population, (Juenemann et al. 1972 cited by Snow 1973;

WYGF 1983); the breeding populations were only found in more isolated areas like the Kelly Creek Ranger District (Johnson and Melguist 1973).

The construction of the Dworshak Reservoir could have enhanced the study area for breeding bald eagles because of their affinity for large open expanses of water (USFS 1981; WYFG 1983). The Bald Eagle Recover Team has set a goal of 1 nesting pair of bald eagles for the Clearwater River/Dworshak area because of this characteristic (Wayne Melguist, IDFG pers. commun.). However, the creation of the reservoir has increased access by boat and roads, facilitated establishment of campgrounds, increased on and off site logging activites through more economical log transportation, thereby eliminating or severely restricting the possibility of re-establishment of nesting eagles in a known historical breeding ground. Elk mitigation activities, in the hard core area which includes 75 clearcut units, encompassing 2,905 acres (USACE 1985), have eliminated possible nesting sites from the study area. Increased access to log handling sites on the reservoir, has encouraged extensive logging contracts, on private and state lands adjoining Corps Lands thus eliminating thousands of acres of possible nesting sites along the border areas of the study site. In total, 25,900 acres, within the study area (above Dent Bridge), of historical and potential bald eagle nesting habitat were lost, facilitated by increased human activity in the area (Table 4).

The present status of the prey base available in the reservoir and what the impacts of changes in reservoir morphology and productivity are being studied at this time (Nez Perce Tribal Fisheries pers. commun.). The effects of turbidity, erosion, density currents and reservoir fluctuation on the fisheries of Dworshak Reservoir is not known. Long term reliability of a prey base under these conditions is doubtful.

Wintering eagles were affected first by the elimination of the salmon runs due to the construction of the Washington Water Power Dam in Lewiston. Changes in the facilities and an Idaho Fish and Game reintroduction program increased chinook salmon until Dworshak Dam blocked any further runs. With the loss of this run, the eagles lost a major source of early winter food. The introduction of kokanee has initially provided a replacement of early winter food. The present status of the Kokanee population is under study by the Idaho Fish and Game at the present time (IDFG pers. commun.). Flushing of kokanee through the dam, providing dead or dying fish for eagles is an option but an unstable one. This food source for bald eagles is inconsistent at best. The amount of carrion in the area and the stability of the

Table 4. Acreage of land impacting bald eagle nesting from the construction of Dworshak Dam above Dent Bridge.

Type of Impact	Area (ac)
Inundation	8064
Project Operations	51.7
Log Handling Operations	118.4
Recreation High Density	173.2
Recreation High Density Future	600.3
Wildlife Management Intensive	9852.2
Wildlife Management Moderate	7040.9
	Total 25900.7

source is unknown. Construction of Dworshak Dam has provided for increased opportunities for the survival of bald eagles if the food source is adequate. Dworshak has provided a 16,417 acre open expanse for feeding on carrion. Bald eagles do not generally feed in brushy areas (Stalmaster 1976). The open drawdown area, the frozen over reservoir and any open water are ideal for feeding areas. The increase in mortality of deer due to lost winter range may also have indirectly benefited bald eagles providing an increase in carrion.

Evidence such as observations of life long residents in the area, occasional documente sightings and knowing the importance of the anadromous fishery in the north Fork Clearwater River, indicates that the North Fork drainage was a historically important breeding area for bald eagles.

The down stream effects of the Dam are variable. The stability of the flows and release of warm water in the winter, provides open stable water flows for waterfowl which are a preferred food source of wintering eagles. However, the stable winter flows of the **lower** Clearwater also will reduce stranding of fish in the river that occured during normal fluctuations.

In general, bald eagles could benefit from the construction of Dworshak Dam, because they are very opportunistic and will take advantage of every situation as long as a stable food source is available and sources of disturbance are kept to a minimum.

Management Goals, Plans and Programs

The state of Idaho's management goals objectives and **programs,** for bald eagles are presented in the IDFG's, Nongame Species Management Plan prepared by Morache et al. (1985). Bald eagles are covered under the raptor management plan for the state. All raptors are protected under state and/or federal law. The bald eagle warrants special attentions because of its endangered species designations by both the State of Idaho and the Federal Government. The State of Idaho has participated on the Pacific States Bald Eagle Recovery Team since its inception and will assist the USFWS with the implementation of the recovery plan as it applies to Idaho. The status overall goals is to cooperate with the USFWS in the recovery plan goal of establishing 31 active bald eagle nests in the State of Idaho.

The Pacific States Bald Eagle Recovery Team's proposed management direction as it pertains to Central Idaho bald eagles is to encourage restoration of anadromous fisheries; locate nesting pairs and increase nesting populations; maintains wintering habitat; protect existing nest sites; and regulate human disturbance. (Karen Steenhof; BLM, pers. Comm.). The recovery team has

designated a goal of one nesting territory for the Clearwater/Dworshak area because of the establishment of

Dworshak Reservoir, however, the recovery team is reluctant to designate specific nesting sites for protection because predicting future bald eagle use in a specific nesting area is difficult at best (Rich Howard, USFWS, pers. comm.). The recovery team will focus on protecting existing nesting sites and their expansion.

The USACE has an obligation under the Endangered Species Act of 1973, to consider the effects of land use activity on those endangered species inhabiting the area of concern (USACE 1985). Habitat management decisions which will enhance the bald eagle population at Dworshak is being considered in land use classification and management plans for the project.

Osprey

Pre-construction conditions

Estimates of osprey populations in the North Fork Clearwater drainages-for the pre-construction era are sketchy at best. Life long residents in the North Fork area have always remembered seeing osprey and osprey nests over the entire length of the North Fork Clearwater River (Alfred Jenks, Frank Altmiller, Fred Warren pers. commun.). These observations were made during the 1920's and 1930's. Larrison et al. (1967) using an annotated checklist by M.T. Jollie during the period 1946-1956, mentions ospreys nesting in the North and Middle Fork of the Clearwater River.

Nesting populations in north and central Idaho have been surveyed extensively since the early 1970's to determine population size and nesting success (Schroeder 1972, Johnson and Melquist 1973, Melguist 1974, Shroder and Johnson 1977 Talbert 1978, Van Daele et al. 1980). In 1971, a total of 166 osprey nests were located in the Coeur d'Alene, Pend Oreille and Clearwater drainages excluding the North Fork Clearwater (Shroeder and Johnson 1977). Melguist (1974) reported locations of osprey nests in the Clearwater, Coeur d'Alene, Kootenai, and Pend Oreille Drainages for 1972 and 1973. He found a total of 270 nests in 1972 and 286 nests in 1973.

It's clear from the above information that a nesting population of ospreys was present in the North Fork area but the exact number is not available. Nesting along the lower Clearwater has not been documented.

Post-construction conditions

The breeding population of osprey on Dworshak Reservoir has been monitored by the USACE since the filling of the reservoir. Asherin and Orme (1978), found a total of 16 nests of which 12 were occupied in 1976. A total of 13 young were fledged in 1976. In 1977, the authors counted 32 nests of which 18 were occupied. Twenty two young were fledged in 1977. Nine percent of all nests were between the dam and Dent Bridge, 25 percent between Dent Bridge and Evans Creek, 19 percent between Evans Creek and Grandad Bridge including the Little North Fork arm and 47 percent above Grandad Bridge.

The draft Waster Plan for Dworshak Reservoir (USACE 1985) shows the locations of 43 nests. Nine nests (21%) were located between the dam and Dent Bridge, 6 nests (14%) between Dent Bridge, 9 nests (21%) between Evans Creek and Grandad Bridge, and 19 nests (44%) above Grandad Bridge. Since the filling of Dworshak Reservoir, there has been a steady increase in the number of nesting osprey.

Osprey nests have not been documented for the lower Clearwater River from the State Line to Orofino, however, an inventory of osprey nests conducted by the Nez Perce Indian Tribe Wildlife Program (Lawrence 1985), found 11 osprey nests (6 active) along the Middle Fork of the Clearwater River from Orofino to Kooskia, ID. Over half the length of the lower Clearwater is similar in vegatative Cover to what is found along the Middle Fork.

Impact assessment

The construction of Dworshak Reservoir has increased breeding opportunities for osprey above the dam. The loss of nesting sites inundated by the reservoir does not appear to be a limiting factor in the study area, although, 5764.9 acres have been eliminated as nesting sites due to project operations such as log handling facilities, high density recreation and timber harvested for elk mitigation. Any losses of nesting opportunities on the remaining 25,170.5 acres will depend on the levels of human activity on the reservoir, in and around nesting ospreys. As road and boat access increases as expected on Dworshak Reservoir (USACE 1985), existing populations of nesting osprey will be adversely impacted.

USACE lands provide only a narrow buffer around the reservoir from private land owners that have clear cut their timber down to the Corps boundary. This makes the corps "buffer" all the more critical as nesting habitat. The narrowness of the buffer zone combined with adjacent logging activity, has created extensive tree blow down problems, which the Corps is now experiencing (USACE pers. commun.) on hard core elk mitigation lands. Tolerance for nesting near logged over areas is not known.

The total amount of feeding area for ospreys has increased substantially from 1,700 to 16,417 acres. The condition of the fishery in Dworshak Reservoir with respect to the preferred fish species taken by osprey is not known. There have not been ecological studies done on this population of osprey to determine what their food habitats are and what their breeding success is.

Time delayed adverse effects on the fishery in Dworshak Reservoir would have a detrimental impact on the osprey population. Many newly created reservoirs exhibit a boom in fishery production upon filling, followed by a subsequent fish population collapse several years later. Fisheries studies such as those recently initiated by the Nez Perce Tribe and IDFG may provide answers to the questions that need to be answered before the interelationship of Dworshak Dam and the osprey population can be clearly interpreted.

The reason for the lack of nesting osprey along the lower Clearwater is not known. It is not known whether nest site characteristics or prey availability limit use of this area. No completed study is available to explain why osprey limit their use of the lower Clearwater River. A possible explanation could be that higher minimum flows and reduced maximum flows has increased human activities along the river through increased boat fishing, which increases harassment. River stabilizing also tends to move human activities like agriculture, dwellings and road construction closer to the waters edge, decreasing the width of the riparian zone.

Management Goals, Plans and Programs

The State of Idaho's management goals, objective and **programs**, for osprey are presented in the Idaho Department of Fish and Game's Nongame Species Management Plan prepared by Morache et al (1985). Ospreys are covered under the raptor management plan for the State. All raptors are protected under state and/or federal law. The department will endeavor to acquaint the public with raptor identification, ecology, and predator-prey relationships to enhance public understanding and appreciation for raptors in general. An issue of concern with ospreys identification by the state is the absence of nesting sites which may limit density and distribution. The departments strategy for this issue will be to cooperate with approximate agencies to provide artificial nesting platforms and protect natural nesting sites whenever and wherever possible.

The USACE monitor osprey populations on the reservoir and will manage for ospreys through land use classification and management plans for the project.

The Nez Perce Tribe monitors the status and distribution of osprey nests along the Clearwater River lying within reservation boundaries under the Rights Protection Program, administered by the BIA and conducted by the Nez Perce Tribal Wildlife Program.

White-tailed and Mule Deer

Pre-construction conditions

There are no population estimates of white-tailed or mule deer in the lower drainage during the pre-construction era. There have not been any studies on habitat use, movements, or food habits on this population of deer.

Local residents would see white-tailed and mule deer along the upper slopes and along State-Highway 12, where on occasion they would become a road kill (IF&G pers. commun.). Whether these particular animals were members of a resident herd is not known.

Between 1954-1958, Norberg and Trout (1958) conducted a game and range study of the Clearwater Drainage upstream from the confluence of the North Fork Clearwater River. They delineated white-tailed deer winter range to include the Clearwater River from the confluence of the North Fork upstream to Kamiah, Idaho. They also included the slopes along both sides of the tailwater area of the North Fork. Elevation and exposure being factors used to establish winter range. It would then follow that all the area within the study site falls into the two species winter range designation and the amount of use of would be determined by the severity of the winter.

Post-construction conditions

The inventory of riparian habitat along the lower Clearwater River by Asherin and Orme (1978) is the only information available for post-construction populations of white-tailed and mule deer in the study area. In an aerial survey along the north side of the lower Clearwater conducted on April 18-19, 1977, they observed a total of 16 white-tailed deer from the state line to the mouth of the North Fork, including both sides of the North Fork from the mouth to Dworshak Dam. They recorded 10 deer from the state line to Potlach Creek and 6 deer from Bedrock Creek to the North Fork. They ranged in elevation from 1400 to over 2900 ft. In addition, 2 mule deer were spotted by project personnel at the mouth of Coyote Gulch on March 1, 1977.

Aerial counts along the south side of the lower Clearwater during the same period found a total of 30 white-tailed deer distributed from Lapwai Creek to a point

opposite from the mouth of the North Fork. The deer ranged from 1100 to over 2900 ft. in elevation. Asherin and Orme (1978) observed 3 deer from Lapwai Creek to Cottonwood Creek 13 deer from Cottonwood Creek to Canyon Creek and 14 deer from Canyon Creek to a point opposite the North Fork.

Ten mule deer were also counted during the aerial search. They were distributed from the State line to Cottonwood Creek. All deer were located in the 1400 to 1700 ft. elevation zone. The authors observed 6 mule deer between the state line and Lapwai Creek and 4 mule deer from Lapwai Creek to Cottonwood Creek.

The spring in which the aerial survey was conducted followed one of the driest and most open on record (Asherin and Orme 1978). Because of the lack of snow cover and the early greenup, the survey was considered to be a census of resident animals only. The authors felt had it been a more normal year, many more deer would have been seen due to an influx of migrating deer out of the higher country. Most of the deer observed were seen in brush fields and thickets.

The use of the riparian habitat along the lower Clearwater is considered to be light. Asherin and Orme (1978) saw only occasional use of the riparian zone of deer. On Hay, 22, 1976, deer tracks were observed on Upper Hog Island. The authors recorded deer tracks in black cottonwood and coyote willow riparian communities at RM 31.0, during the spring of 1976. Deer tracks were recorded on sand bars at RM 39.4 during the fall of 1976, and deer pellet groups were noted in a coyote willow stand during the winter of 1977 at RM 31.4.

White-tailed and mule deer road kill records kept by the IDFG in Lewiston, show road kills distributed over most of the length of the lower Clearwater study area. (IDFG unpublished data, 1987).

Impact Assessment

The high mobility of white-tailed deer and mule deer preclude any direct impact by the construction of Dworshak Dam and hydro-electric power generation. With no pre-construction population estimates and no information of the specific ecology of the lower Clearwater deer herds, impacts on deer numbers can't be determined. However, with the knowledge we have at present, it is estimated that there is minimal impact by hydro-electric power generation at Dworshak Dam, on deer numbers and deer habitat, along the lower Clearwater River.

Indirect impacts on deer herds due to blocking of movement patterns by high flows in the lower Clearwater during the fall and winter drawdown, may or may not be detrimental. with the loss of extensive white-tailed deer

winter range in the pool area more animals are being confined into a smaller winter range area. Deer can remain in the area or move to a less stressful situation. The lower Clearwater is situated to provide low elevation winter range to white-tailed deer from the North Fork area. High river flows in the late fall and winter, could prove to be a hazard by drowning or act as a barrier to deer movement. The possible barrier of winter time high flows, added to the hazards of State Highway 12 and the Camas Prairie Railroad may have considerable impact during a severe winter.

Management Goals, Plans and Programs

The state of Idaho's management goals objectives and programs, for white-tailed deer are presented in the IDFG White-Tailed Deer Management Plan, 1986-1990, prepared by Hanna and Meske (1985). The States overall goals for white-tailed deer are to maintain their populations, increase harvest and -provide more recreational opportunity.

Management strategies identified by IDF&G are as follows:

1. The Department will consider cooperative studies to increase ecological information about white-tailed deer in northern Idaho.
2. The Department, in cooperation with appropriate agencies and private landowners, will work to reduce and mitigate the loss of white-tailed deer habitat which they listed as the number one problem concerning white-tailed deer in the future.
3. The Department will continue to cooperate with other law enforcement agencies to reduce unlawful activities as white-tailed deer populations come into increasing contact with human habitation.
4. The Department will deal with depredation caused by white-tailed deer on a case by case basis.
5. The Department will continue to increase and improve their knowledge on population status, age and sex composition of white-tailed deer populations throughout the State.
6. The Department will continue to monitor road kill losses and cooperate with appropriate agencies to reduce these losses.

The state of Idaho's management goals, objectives and programs for mule deer are presented in the IDFG, Mule Deer Management Plan, 1986-1990, prepared by Trent et al. (1985). The States overall goal for mule deer are to maintain the present population size in most units, allow

increases in some units and reduce populations in a few selected units.

Management strategies identified by IDFG to accomplish these management goals are as follows:

1. The Department will work with the USFS and other landowners and managers to use prescribed burning to rehabilitate existing brush fields on winter range and promote the use of clearcut logging, followed by slash burning in the fall, on winter range areas.
2. The abundance and distribution of mule deer in Northern Idaho management units, do not allow efficient data collection in most units. Mule deer information will be collected incidental to programs for elk in most units in Northern Idaho. In higher density units aerial surveys will be conducted to determine population structure and trend.

In concurrence with State management plans, the Nez Perce Tribe has a program of protecting and enhancing valuable white-tailed deer winter range within the reservation. In cooperation with the Tribal Forestry Program, wildlife concerns are incorporated into the forestry program and wildlife impacts are mitigated for on a case by case basis. The Tribe is also establishing a complete habitat inventory of the reservation using GIS and remote sensing which will assist in detailed wildlife management.

River Otter

Pre-construction conditions

There is no information available on population estimates of river otters along the lower Clearwater prior to construction of Dworshak. There is no available information on the ecology, food habits, movements or habitat use by otters along the lower Clearwater. Andy Eaton (pers. commun.) a government trapper and long time resident of Lewiston, recalled seeing river otter quite frequently down in the area of the Washington Water Power Dam in Lewiston. He remembered seeing otters climbing into the fish ladder at the dam trying to catch steelhead. No date was given for that observation.

Rust (1946) stated that in the 1920's, otter were fairly common along many of the larger streams and isolated lakes in northern Idaho but by the 1940's excessive trapping and lack of seclusion reduced there numbers.

Pre-construction trapping records from the State for the lower Clearwater area were not available at the printing of this draft.

Post-construction conditions

The amount of documented information available on the river otter, along the **lower** Clearwater is very limited. The state of Idaho has had a closed season on river otter since the filling of Dworshak so no post-construction records of trapping success is available.

Asherin and Orme's (1978) study recorded 13 supplemental observations of otter along the riparian habitat of the lower Clearwater. The authors recorded 13 observation, 12 of which occurred above RM 25.3. The remaining observation was at RM 9.0. The river otter was not associated with a particular vegetation type, but tied to sandy banks where tracks were recorded. Sightings of single individuals were also recorded. Local residence, have observed otters-on sand bars, scattered along the river bank, sitting and feeding (Roger van Houten pers. conmmun.) I observed a single otter on the island at the mouth of the Potlatch River (RM 15) and on another occasion 2 otters swimming and feeding around RM 37.

Melguist (1981) found a minimum population of 41 otters in the Cascade Reservoir area in West central Idaho. He estimated otter population densities from one otter per 1.6 miles, to one otter per 3.0 miles. Wayne Melguist (per-s. commun.) felt that otter densities along the lower Clearwater would not be so much unlike what he found along the Payette River.

Impact assessment

The impact of Dworshak Dam and hydroelectric power generation on the lower Clearwater population of river otter is a complex one. Site specific impacts on otter numbers is not available and because of their mobility and adaptability, down stream impacts of Dworshak Dam may be isolated, temporary, or just an inconvenience. The primary impact on river otters would be to the otters prey base. Otters are opportunistic predators that will feed on a number of prey species (Larrison 1967). Melguist (1981) stated that "prey species consumed by otter were generally taken in direct proportion to their relative abundance." However, the author also found that vulnerability of prey was also a contributing factor. The short and long term impacts of river flow fluctuations due to power generation at **Dworshak,** on fish species diversity, distribution, and reproductive success downstream is very important to the otters survival.

Frequent fluctuation in river flows may provide stranded prey in shallow pools and slack water areas and

become important in their foraging success. Increased riparian habitat due to stabilizing of the river may increase den and resting spots, as long as the water level remains stable, but if fluctuations occurred that exposed the entrance to the den, otters could fall victim to terrestrial predators (Asherin and Orme 1978).

Reduced maximum flows in the lower Clearwater has provided the stability needed to increase human activities like agriculture, dwellings, roads, and railroad construction without fear of damage. This increased pressure along the riparian zone along the river will eventually be detrimental to river otters which require this area to survive.

Management Goals, Plans and Programs

The State of Idaho's management goals, objectives, and programs for river otters are presented in the IDFG Furbearers Species Management Plans1986-1990, prepared by Toweill et at. (1985). River otters are classified as furbears in Idaho but the season has been closed since 1972 due to declining populations. Overall goals of the State are to maintain river otter populations and distribution. Encourage nonconsumptive enjoyment of river otters and improve the data base on river otter populations. Several management strategies identified by IDFG are as follows:

1. The Department realizes that accidental catches of river otters will occur. To minimize impacts on the river otter population, the Department will (a) require that trappers check traps at least every 72 hours and release, if possible, non-target animals accidentally trapped; (b) aid in release of others if necessary; (c) form a committee comprised of trappers and Department personnel to jointly develop a mechanism to allow trappers to deliver river otters accidentally captured to Department personnel.
2. The Department will develop and implement a statewide data collection system for monitoring river otter distribution and populations.
3. The Department will (a) inventory unoccupied suitable river otter habitat; (b) determine relative priorities for introducing river otters into identified areas; and (c) stock these areas as river otters and funds become available through capture at fish hatchery depredation sites.

Beaver

Pre-construction conditions

Beaver are a valuable fur bearing species in the state of Idaho with the Idaho Fish and Game issuing trapping permits in areas that can sustain a yearly harvest or if an individual beaver becomes a nuisance, they are removed by permit or by live trapping (IDFG per. commun.). The number of permits issued depends on population size and will vary depending on the amount of area included within the permit area. Reporting of harvest to the Idaho Department of Fish and Game is on a county wide basis so population estimates for the lower Clearwater would not be site specific. Information on population estimates, the ecology, movements, and habitat use for beaver in the lower Clearwater during the pre-construction era does not exist. Life long residents in the area remember that along the lower Clearwater beaver occurred more commonly in areas of tributary creeks that have an abundance of deciduous trees and shrubs the beaver use as food and building material Andy Eaton (pers. commun.), a long time resident, recalled that beaver huts built along the river at times fell victim to large spring floods but as soon as the maximum flows were over, the beaver were right back rebuilding.

Post-construction conditions

The only work done on determining population estimates of beaver and overall habitat use has been Asherin and Orme (1978) inventory along the lower Clearwater. The authors conducted an extensive search along the lower Clearwater to find beaver dens and evidence of use. A total of 35 supplemental observations were made during the study. It was not clear, in the study, if these observations included actual beaver sightings or just evidence that beaver had been there, or a combination of the two. The authors found all observations were associated with riparian habitats or the river and adjacent ponds.

The above study conducted an intensive search for beaver dens in July of 1977. Seventeen bank dens were located with 10 showing current activity. Asherin and Orme determined annual beaver production was 40 individuals and a total population of 50 to 60 animals. The authors found, through trapper surveys, that 72 beaver were trapped along the lower Clearwater between 1972 and 1976. Forty three of this total were in 1976, a year of good fur prices the authors pointed out. This trapping information also included beaver trapped in the Potlatch River drainage.

Impact assessment

Asherin and Orme's (1978) study established population estimates of beaver along the lower Clearwater. The authors felt that, if mortality factors are not significantly high, their data indicated an expanding population . The specific behavior and ecological requirements that permitted beaver to survive along the lower Clearwater was not documented by Asherin and Orme (1978).

The irregularity of releases from Dworshak and the timing of these fluctuations may cause increased vulnerability to predation by repeated exposure of dens to dewatering. Unseasonably high flows in the fall and winter would increase the amount of energy beaver would have to expend making repairs and adjustments to dens and food caches. This would occur during the season of normally reduced outside activity.

The stabilizing of seasonal flows in the lower Clearwater after the construction of Dworshak Dam will increase the desirability of the riparian zone to be used in agricultural activities, construction dwellings, road and railroad construction and for increased recreational use, like boat fishing.

The total amount of riparian habitat will decrease due to man's encroachment and the amount of animal harassment by man will increase as the frequency and intensity of human activities increase along the river corridor Slough and Sadleir (1977) felt that railways, roads, and land clearing often are adjacent to waterways and may be major limiting factors affecting beaver habitat suitability.

Managementt Goals, Plans andPrograms

The state of Idaho's management goals, objectives and **programs,** for beaver are presented in the IDFG Furbearers, Species Management Plans, 1986-1990, prepared by Toweill et at. (1985). Beaver are classified as furbearers in Idaho, contributing substantially to the overall economic value of trapping in the state. General goals outlined by the State are to maintain or increase annual beaver harvest seasons and encourage nonconsumptive use and enjoyment of beaver and their habitats.

Management strategies identified by IDFG are as follows:

1. The Department will (a) direct trappers into chronic beaver damage areas; (b) continue to handle beaver damage complaints on private lands on a complaint basis; (c) continue a program of landowner education stressing means of preventing beaver damage and correcting problem situations;

(d) encourage landowners to use beaver to control erosion, raise local groundwater levels, and create ponds whenever appropriate; and (e) authorize beaver kill permits to landowners when necessary.

2. The Department will consider positive and negative impacts of heaver dams on fish and wildlife habitat on public lands when establishing goals, objectives and regulations for beaver management.
3. The Department will (a) adjust general season length as necessary to increase or decrease harvest; and (b) use controlled beaver trapping units only as necessary on a local basis.

Canada Goose and Mallard

Pre-construction conditions

The lower Clearwater **River** falls along the fringes, of important travel lanes for waterfowl in the Pacific Northwest (Bellrose 1976). No information on breeding or wintering duck and geese population estimates were found for the pre-construction era along the lower Clearwater. In general, the lower Clearwater did not fulfill ideal nesting requirements for nesting mallards **or** geese, that were described by Bellrose (1976), unless nesting occurred in isolated areas such as on islands and in slackwater areas or ponds near the river. The slackwater area around the Washington Water Power Dam may have had some isolated nesting.

The use of an area for wintering is dependent on the amount of open water (Bellrose 1976). With the majority of the lower Clearwater being prone to freezing in the winter, only the first 12 miles of the lower Clearwater were used by wintering waterfowl and surveyed by Idaho Fish and Game. Early surveys were not available at this printing.

Post-construction conditions

In 1976, a waterfowl nesting survey conducted by Asherin and Orme (1978) accounted for 1 mallard nest and 2 additional broods near the ponds along the Lewiston Dike and 1 brood on the sewage pond near Orofino, for a total minimum production of 22 mallards. A minimum production of 8 shovelers and 7 common mergansers was recorded. In 1977, the authors accounted for a minimum production of 67 mallards, 4 American wigeon and 45 common mergansers.

Goose nesting surveys were conducted on islands in the lower Clearwater by Asherin and Orme (1978), in cooperation with IDFG. The surveys were conducted in 1976

and 1977. In 1976, the authors found goose nesting occurring on 6 islands. A total of 21 nests were found, 19 hatched successfully and 89 goslings were produced. Upper and Dower Hog Islands each recorded 8 nests for 76% of the nests surveyed. In 1977 the survey recorded 30 goose nests, with 24 hatching successfully producing 121 goslings. Upper and lower Hog Islands again, provided the most suitable nesting habitat recording 22 nests, 11 each, for 73% of the recorded nest count. During the 1976 and 1977 goose nestings surveys, measurements from the nests to the high water mark were taken. The authors found: 7 nests (14.6%) in the flood plain, 28 nests (58.3%) from 0-10 meters, 7 nests (14.6%) from 10-20 meters, 1 nest (2.1%) from 20-30 meters and 5 nests (10.4%) >30 meters from the high water points on the islands. No nests were lost due to flooding during these surveys.

Subsequent surveys conducted by IDFG were not available at this printing. Wintering populations of waterfowl were associated along the shoreline of the islands and numerous gravel bars (Asherin and Orme 1978). Wintering geese were found mainly on islands or the goose pastures developed along the lower Clearwater by the USACE.

Impact assessment

Decreased maximum flows along the lower Clearwater reduced the ability of the river channel to maintain or create new island, stream bank and flood plain habitat by scouring and flooding low lying areas. This reduced the overall carrying capacity of nesting waterfowl due to reduced the amount of unique habitat within the flood plain of the lower Clearwater.

Frequent flow fluctuations between the seasonal high and low water marks can cause flooding of nests that lie within the flood plain. Asherin and Orme (1978), found over 14% of the goose nests surveyed fell in the flood plain which would be susceptible to reoccurring high flows.

The increase in the stability of the river has allowed further vegetation succession to occur within the high and low water marks on islands throughout the length of the river. Over 82 acres, on the islands that were analyzed, have become more vegetated, due to the lack of scouring and flooding, thus possibly becoming more attractive to nesting geese and mallards. This zone still is regularly flooded during power peaking during the breading season which would make this zone unavailable for successful nesting.

Controlled low-flows during the breeding and brooding season has also increased access to favorite shorelines for fishing, swimming, or boating which can be detrimental to brooding and nesting waterfowl. Asherin and Orme (1978) found goslings of mixed ages within one group which showed

broad separation in nesting dates which they attributed to possible harassment by human activities in the area. No firm data was presented to collaborate their hypothesis.

Increased flow fluctuations on the lower Clearwater probably reduces the amount of primary production due to frequent dewatering along shallw areas, although there has been no work done on the changes in primary production, species diversity, survival and coverage, along the lower Clearwater, that occur under the present flow regime.

Opportunities for wintering waterfwl have increased due to the ice free river conditions over the entire length of the lower Clearwater, however, the increased fall and winter flows reduce the amount of exposed gravel and sand bars used for loafing. Increased fall and winter flows also increase access by boats during steelhead season which can be a continual harassment to wintering geese and mallards.

Management Goals, Plans and Programs

The state of Idaho management goals, objectives and programs for Canadian geese and mallards are presented in the IDFG, Water Fowl Management Plans, 1986-1990, prepared by Will et al. (1986). The States overall goals for Canadian goose and mallard populations are to increase Idaho's local and wintering Canadian goose/mallard populations. Encourage other agencies and organizations to increase populations of Canada geese/mallards and maintain populations of all waterfowl which migrate into or through Idaho. Increase the annual harvest and recreational hunting opportunities. Increase water fowl habitat in Idaho.

Management strategies identified by IDFG to fulfill these goals are as follows:

1. The Department will attempt to increase Idaho's duck/goose productions by improving nesting habitat on WMA's (Wildlife Management Areas) that benefit waterfwl, cooperate with Ducks Unlimited in there new Marsh Program and cooperate with other agencies and private landowners in making their lands more productive for waterfowl.
2. The Department will acquire food for ducks for use in summer, fall and winter. This will increase local duck production, improve duck distribution and hunting opportunity during the hunting season, and reduce damage to crops on private lands.
3. The Department may continue to monitor lead poisoning in duck and geese, keeping the public

informed and adjusting hunting regulations accordingly.

4. The Department will adopt regulations which create hunting closures to improve duck and hunter distribution and will cooperate with the USFWS in adopting hunting regulations and management practices.
5. Specifically, the lower Clearwater area, the Department established a wildlife preserve from Spaulding to the Eighteenth Street Bridge in Lewiston, Idaho and between U.S. Highway 12 and the Camas Prairie railroad line (Idaho Code; 36-1908) for the protection of wild animals and birds, and their breeding places. The Department maintains goose nesting platforms on a number of the larger islands along the lower Clearwater and conducts nesting surveys for production estimates. At the present time, a minimum of 20 breeding pairs is the goal set for the lower Clearwater River.

Great Blue Heron

Pre-construction conditions

Documentation, of pre-construction population estimates of the Great Blue Herons along the lower Clearwater, was not available. Great Blue Herons are large conspicuous birds that build large conspicuous nests but often require isolated nesting habitat (Short and Cooper 1985). Any nesting that did occur, would probably be along an isolated creek or gulch that provided sufficient nesting habitat and is isolated from the activities along the lower Clearwater. Since the lower Clearwater does fall within its breeding range (Peterson 1961; Chandler et al. 1966), it is assumed that the study area would provide primarily feeding habitat during the breeding season.

Great Blue Herons are migratory where the water freezes (Udvardy 1977) so most of the lower Clearwater that froze up during the winter would have no wintering herons. Great Blue Herons would likely winter in the Lewiston stretch of the **Lower** Clearwater which remained ice free.

Post-contruction conditions

The only documentation available for Population estimates and season of use, by Great Blue-Herons is found in Asherin and Orme (1978) inventory of riparian habitats of the lower Clearwater River. The authors recorded sightings of Great Blue Herons along the lower Clearwater

in every month of the year, except June 1976 and May/June 1977. They recorded monthly highs of 13 and 12 herons for March 76 and February 1977, respectively. A total of 141 sightings were recorded with 27 (19%) occurring in the summer (May-Aug.), 47 (33%) occurring in winter (Nov.-Feb.), and 67 (48%) occurring in the combined period of spring (Mar.-April) and fall (Sept.-Oct.). The authors recorded 102 (72%) of the sightings associated with the river, slough or ponds. This was true throughout the year. Coyote willow vegetation type, rock rip rap, gravel and sand bars, and cheatgrass-braze/annual forb vegetation type, were also habitats that were frequented by herons along the lower Clearwater.

Impact assessment

Reduced maximum flows will reduce the extent that low-lying areas and sloughs within the flood plain will regenerate and provide prey species for Great Blue Herons. In rivers with only a narrow flood plain like the lower Clearwater, seasonal recharging of this flood plain provided unique islands of habitats that one are not normally abundance in the area.

Frequent daily fluctuations along the lower Clearwater would alternately water and dewater areas around and between islands, leaving stranded prey more vulnerable. The advantage or disadvantage of this would depend on the prey species ability to withstand this type of depredation to its populations.

Since fish are an important item in the diet of herons (Short and Cooper 1985), the health of the fishery is important to it's survival. The stability of the fishery, in regards to the preferred prey species of herons in the lower Clearwater is unknown.

The temperature change of the water from pre-construction to post-construction has provided ice free foraging areas for most of the winter along the lower Clearwater. Wintering populations of herons have probably increased while population changes, due to the construction of Dworshak are not know.

Increased stability of the lower Clearwater will increase man's activities along the river. Increased agricultural development, dwellings, road and railroad construction are a few of the activities that reduce the width of the riparian zone and increase harassment of wildlife. This would be critical during the breeding season.

Management Goals, Plans and Programs

The State of Idaho's management goals objectives and programs for great blue herons and waterbirds in general are presented in the IDFG, Nongame Species Management

Plans, 1986-1990, prepared by Morache et al, (1985). Great blue herons are covered under the waterbird management plan for the State. All nongame waterbirds are protected under the Migratory Bird Treaty Act and Idaho State Law. The States overall goals are to increase public awareness and knowledge of waterbirds in Idaho. A State issue is that herons frequently prey on fish in hatcheries. The Departments strategy is to cooperate with the USPWS, the agency with primary responsibility for problems; modify existing Department fish hatcheries where chronic problems occur, and incorporate control structures in new hatcheries to minimize depredation.

Yellow Warbler

Pre-construction conditions

Yellow warblers are abundant breeding birds throughout the United States (Peterson 1961, Chandler et al. 1966). Low, shrubby vegetation of bogs and river edges is preferred (Udvardy 1977). Larrison et al. (1967) lists the yellow warbler as a common breeder in the riparian areas of streams and rivers in Idaho. More than 90% of the food of yellw warblers are insects (Bent 1953 cited in Schroeder 1982). Population estimates of yellow warblers during the pre-construction era are not available for the lower Clearwater River.

Post-construction conditions

Asherin and Orme's (1978) inventory of the riparian habitat along the lower Clearwater River listed the yellow-warbler as abundant during the summer months of May-Aug. and as an occasional visitor during the spring (March-April) and Fall (Sept.-Oct). The author recorded 248 observations of yellow-warblers, all of which occurred in the summer. They found that 83% of the observations occurred in 6 of the 19 habitat categories listed (Table 5). All of the habitat categories that the yellow-warbler occurred in but one (mixed conifer-Douglas Fir, serviceberry) were found within the lower Clearwater study area.

Impact assessment

Stabilizing seasonal flow fluctuations along the lower Clearwater River would stabilize the riparian shrub habitat causing it to expand to areas that used to be barren. However, continually advancing stages of riparian habitat (toward climax) may be detrimental in the long run.

Increased stability also increases man's activities in the area through agriculture, dwellings, road and railroad construction, and increased activities on the

Table 5. Vegetation types and the associated counts of yellow warblers found by Asherin and Orme (1978) along the lower Clearwater River.

Vegetation Type	count	%
Ponderosa Pine/Mixed Deciduous Shrub	63	25.4
Spaulding National Park	42	16.9
Black Cottonwood/Woods Rose	32	12.9
Xeric and Mesic Mixed Deciduous Shrub	28	11.3
Peachleaf Willow	22	8.9
Siberian Elm	20	8.1
Coyote Willow	14	5.7
Mixed Conifer (Douglas Fir)/Serviceberry	12	4.8
Tree-of-Heaven	9	3.6
Ponderosa Pine/Cheatgrass	4	1.6
Annual Forb	2	0.8
Total	248	

water. These activities would decrease the width of the riparian zone and increase harassment.

Management Goals, Plans and Programs

The State of Idaho's management goals, objectives, and programs for yellow warblers are presented in the IDFG, Nongame Species Management Plans, 1986-1990, prepared by Morache et al (1985). Yellow warblers are covered under the passerine bird management plan for the State. All species except the European starling, English sparrow, and rock dove are protected under the Migratory Bird Treaty Act and/or state law. The Department's overall goals is the expand surveys use to determine trends in passerine bird populations statewide, and expand public awareness regarding passerine birds through information and education channels. Urban dwellers will be encouraged to participate in feeding and in making habitat improvements for passerine birds in general. The Department will support Audubon chapter members in the establishment and maintenance of additional permanent breeding bird survey transacts to monitor summer distribution and population trends.

Issues that the State have identified which would most directly affect yellow warblers are habitat destruction and the use of insecticides and other toxicants. Strategies for handling these two issues are as follows:

1. The Department will encourage the rural public to improve passerine bird habitat by working cooperatively with the Soil Conservation Service (SCS) and the Agricultural Extension Service to encourage conservation practices relating to bird habitat.
2. When mortalities are apparent, the Department will work with the USFWS and EPA to eliminate the use of chemicals harmful to wildlife.

Chukar and California Quail

Pre-construction conditions

The chukar and the California Quail are typical representatives of the diverse upland game birds that occur along the lower Clearwater River. The chukar is an introduced (Asian) upland game bird that inhabits rocky, grassy or brushy slopes, commonly found in arid mountains and canyons (Peterson 1961). Salter (1952 cited in Asherin and Orme 1978) summarized initial chukar introductions in Idaho and reported the release of 121 birds in Nez Perce County in 1933. This plant was

apparently unsuccessful, though an introduction in 1939 and subsequent introductions in adjacent areas have established chukars in the lower Clearwater drainage. No information or population estimates of chukars populations in the lower Clearwater river was found.

California guail is another introduced species to the study area. This small upland game bird prefers woodland shrub edges and brush with opening (Udvardy 1977). Population estimates and habitat use studies for the lower Clearwater were not available.

Post-construction conditions

Asherin and Orme (1978) conducted audio census routes to document presence and distribution of upland game during the breeding season. The authors also ran flushing counts for determining population estimates and densities.

The audio census routes recorded most of their chukar responses along the Spalding to Myrtle (RM 12.0 to RM 18.2) route for an average of 18.5 calls 1976, and 30.0 calls in 1977. California quail had the most abundant call responses and were found along the entire length of the lower Clearwater. The best route for quail call responses was from Cherrylane to Lenore (RM 21.3 to RM 28.8), with an average number of responses of 222 in 1976 and 301 in 1977.

Flushing counts conducted by Asherin and Orme (1978) recorded a total of 22 chukars in 1976, across from Turkey Island (RM 13.8), in Ponderosa Pine/Mixed Deciduous Shrub type, for a density of 1.6/acre. None were recorded in 1977. A total of 206 California Quail were recorded in 1976, with 95% of the birds occurring in 3 vegetation types; Annual Forb (33%), Black Cottonwood/Wood's Rose (27%), and Ponderosa Pine/Mixed Deciduous Shrub (35%), vegetation type. In 1977, a total of 107 quail were recorded. All, (100%) of the quail were recorded in 3 vegetation types, Ponderosa Pine/Mixed Deciduous Shrub (50%), Annual Forb (27%), and Black Cottonwood/Wood's Rose (22%) vegetation types.

No information on subsequent, upland game bird population estimates were found for the lower Clearwater River.

Impact assessment

The reduction of uncontrolled flooding would have a positive impact on upland game birds in general because of the risk of washing nests away. Stabilizing the flows would also lead to advancing the maturity of the riparian habitat which would offer more grass/shrub cover, decreasing vulnerability to predators. Daily fluctuations however, may cause adverse problems. Daily changes in

distance from available water to cover may increase vulnerability to predation.

Stability of the lower Clearwater River has increased the ability of man's activities to move closer to the main river channel by the use of agriculture, dwellings, and road and railroad construction. Boating activities can also increase with increased minimum flows. All of these activities tend to reduce the width of the riparian zone and increase harassment of wildlife in the area.

Management Goals, Plans and Programs

The state of Idaho's management goals objectives and programs, for chukars and California quail are presented in the IDFG, Upland Game Management Plan, 1986-1990 prepared by Rybarczyk et al. (1985). The States overall goals for chukar partridge are to increase chukar population levels, increase harvest to a level above the long-term average and increase recreational opportunities. The States overall goals for California quail are to reduce the rate at which quail habitat is being lost, create and enhance habitat whenever possible maintain harvest, and maintain recreational opportunities.

Management strategies identified by IDFG to accomplish these management goals are as follows:

1. The Department will (a) identify riparian areas in poor conditions and work with the responsible parties to improving habitat; (b) encourage land managers to preserve riparian habitats through proper livestock management and rehabilitation projects; and (c) work with other groups who have sponsored legislation to protect riparian areas.
2. The Department will (a) conduct a detailed analyses of current and past guail population data and methods used to obtain this information; (b) consider implementing brood count routes where practical in conjunction with another survey; (c) monitor long-term.
3. The Department will identify areas where additional water developments might benefit chukars and will encourage land managers to (a) develop water sources (ponds, guzzlers, etc.) to wildlife; (b) fence springs and seeps to exclude livestock and provide maximum benefits for wildlife; (c) manage existing water facilities to provide water for wildlife throughout the summer; (d) install and maintain escape ramps in livestock watering tanks; (e) document losses of water sources in chukar habitat and seek mitigation; and (f) recommend that water be made available for wildlife at new water developments.

4. The Department will cooperate with and encourage land managers to undertake projects to rehabilitate areas invaded by medusa head and prevent further habitat loss.
5. The Department will not advocate land management practices that maintain or create annual dominated grasslands.

Summary

In summary, the construction of Dworshak Dam and Reservoir has changed 53.6 miles of the North Fork Clearwater River and tributary creeks and rivers from a natural riverine habitat to a lacustrine habitat which due to a reservoirs unique morphology undergoes a constant and relatively rapid deterioration due to erosion, sedimentation, changes in water temperature, and changes in water chemistry. The construction of the reservoir has increased access to include on and off site logging activities, recreation facilities and road construction. All these factors have an impact on wildlife in the area.

Downstream changes in the lower Clearwater include: ice free river flows throughout the year; water temperatures that are cooler in the summer and warmer in the winter; rapid and frequent flow fluctuations; smaller maximum flows and higher minimum flows, and changes in channel and island maintenance.

Use of only available information did not allow for quantification of impacts on the selected target species. Possible sources of impacts have been identified. A summary of the impact on selected target species is as follows:

1. Bald Eagles - There was an impact on breeding bald eagles due to a loss of 25,900 acres of historical nesting habitat to inundation and increased human activities. The loss of the anadromous fishery in the North Fork Clearwater River has had a major impact on the prey base of bald eagles. The introduction of Kokanee and a resident fisheries stocking program has moderated, the loss of a major anadrcmous fishery. The mitigation goals for bald eagles in the study area is to reestablish a breeding population of bald eagles in the North Fork Clearwater Drainage and establish a reliable prey base for wintering bald eagles.

2. Osprey - We found an increase in feeding habitat from 1,700 acres to 16,417 acres, If the fisheries is found to be stable, the osprey population should stabilize or increase, but if the prey base deteriorates due to changes in the productivity of the reservoir, osprey populations will decrease. There was a loss in the total amount of nesting sites available due to inundation but this shouldn't be a limiting factor. No nesting osprey are found below the confluence of the North Fork Clearwater River. The mitigation goals for osprey are to provide a

reliable prey base, protect and enhance nesting habitat and reduce disturbance of nesting pairs.

3. White-tailed Deer and Mule Deer - No direct loss of habitat was detected but there could be restrictions to seasonal movements over 40.3 miles of the lower Clearwater River. Impacts from changes in the riparian habitat would be small due to the limited use of the riparian zone by the local deer populations. Mitigation goals for mule and white-tailed deer is to protect and enhance winter range within the lower Clearwater River corridor.

4. River Otter - There could be impacts due to changes in water temperature, flow fluctuations and water chemistry. The fisheries and the food web of primary producers coul be negatively affected, which would impact fisheries essential to the survival of river otter. Changes-in channel and island maintenance will also effect food availability and fisheries productivity. These changes have occurred along 40.6 miles of river and on over 207 acres of islands and river shoreline that are annually flooded. Mitigation goals for river otter are to identify protect and enhance, when possible, the ecological niche the river otter has established for itself along the lower Clearwater River.

5. Beaver - There was an impact on beaver due to frequent flow fluctuations increasing vulnerability to predators by reducing cover, and exposing den entrances. The fluctuations have also changed the vegetative makeup of the riparian habitat, the extent of, we do not know. This has occurred on 40.6 miles of river shoreline and over 207 acres of island riparian habitat. Mitigation goals for beaver are to protect and enhance through areas of riparian habitat that are identified as important for the beaver population along the lower Clearwater River.

6. Canada goose - Nesting losses could be possible due to water fluctuations on over 207 acres of islands. Reduced benthic productivity and latteral vegetation due to frequent water fluctuation will reduce nesting success and winter survival. Availability of wintering habitat was increased because the lower Clearwater remains ice-free year-around. Mitigation goals for Canada geese and mallards are to protect and enhance nesting habitat and protect winter foraging and loafing areas from human disturbance.

7. Great Blue Heron - Losses in feeding habitat could be seen due to frequent water fluctuations but an unknown impact would be possible with 40.6 miles of ice free river. Mitigation goals for great blue heron are to protect and enhance shallow feeding areas for wintering blue herons, that are protected from human disturbance.

8. Yellow Warbler - An increasing population could be possible due to an increase in the maturity of the riparian zone. Mitigation goals for yellow warbler is to protect and enhance the riparian area along the lower Clearwater River corridor. Protect against the encroachment of human activities.

9. Chukar and California Quail - There should be minimal impact to chukar and Quail if flood plain riparian habitat is protected from increased human activity and habitat encroachment. Mitigation goals for chukar and California quail is to protect and enhance suitable habitat within the flood plain **of** the lower Clearwater which could benefit chukars and California quail. Emphasis needs to be placed in the future on the impacts to 40.6 miles of river riparian habitat from delayed impacts that have not yet been investigated. Little documentation was available on site specific downstream effects due to the construction and operation of Dworshak Dam.

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Appendix A.1 Flows from Dworshak Dam and height of the Clearwater River at Peck, Idaho from January 1986-1987.

Date	Flows x 1000 (cfs) High	Low	Average	Height of River Low	High	Date	Flow x 1000 (cfs) High	Low	Average	Height of River Low	High
01/01/86	2.6	1.9	1.9	4.3	5.7	01/01/87	2.3	2.3	2.3	4.3	4.4
01/02/86	10.4	1.9	7.4	4.3	7.5	01/02/87	2.3	2.3	2.3	4.3	4.3
01/03/86	10.0	5.1	9.7	6.5	7.4	01/03/87	2.3	2.3	2.3	4.3	4.4
01/04/86	2.2	2.2	2.2	4.6	6.5	01/04/87	2.3	2.3	2.3	4.4	4.4
01/05/86	2.2	2.2	2.2	4.6	4.6	01/05/87	2.3	2.3	2.3	4.4	4.4
01/06/86	2.2	2.2	2.2	4.6	4.6	01/06/87	2.4	2.3	2.3	4.4	4.4
01/07/86	2.2	2.2	2.2	4.6	4.6	01/07/87	2.3	2.3	2.3	4.3	4.4
01/08/86	2.3	2.1	2.2	4.6	4.6	01/08/87	2.3	1.0	1.1	3.6	4.3
01/09/86	5.2	0.9	1.4	3.9	5.7	01/09/87	1.1	1.0	1.1	3.1	3.6
01/10/86	2.0	1.0	1.1	4.0	5.4	01/10/87	1.0	1.0	1.0	2.9	3.1
01/11/86	1.1	1.0	1.1	4.1	4.2	01/11/87	1.1	1.0	1.0	2.8	3.0
01/12/86	1.1	1.1	1.1	4.1	4.1	01/12/87	1.1	1.0	1.0	2.8	3.2
01/13/86	1.1	1.0	1.1	4.0	4.1	01/13/87	1.1	1.0	1.0	3.1	3.8
01/14/86	1.5	1.0	1.1	3.9	4.1	01/14/87	1.1	1.0	1.1	3.7	3.8
01/15/86	1.3	1.0	1.1	3.9	4.0	01/15/87	1.1	1.0	1.1	3.4	3.8
01/16/86	1.1	1.0	1.0	4.0	4.1	01/16/87	1.1	1.0	1.1	3.0	3.4
01/17/86	1.1	1.0	1.1	4.1	4.8	01/17/87	1.1	1.0	1.0	3.0	3.2
01/18/86	1.1	1.0	1.1	4.7	4.9	01/18/87	1.1	1.0	1.0	3.1	3.2
01/19/86	1.1	1.0	1.1	4.7	5.0	01/19/87	1.0	1.0	1.0	3.2	3.6
01/20/86	1.1	1.0	1.1	5.0	5.2	01/20/87	1.1	1.0	1.0	3.5	3.7
01/21/86	1.2	1.0	1.0	4.9	5.2	01/21/87	1.1	1.0	1.0	3.4	3.5
01/22/86	1.1	1.0	1.1	4.7	5.2	01/22/87	1.1	1.0	1.0	3.2	3.5
01/23/86	1.1	1.0	1.1	4.7	4.7	01/23/87	1.0	1.0	1.0	3.2	3.5
01/24/86	1.1	1.0	1.0	4.7	4.8	01/24/87	1.1	1.0	1.0	3.4	3.6
01/25/86	1.1	1.0	1.0	4.5	4.7	01/25/87	1.1	1.0	1.0	3.6	3.7
01/26/86	1.1	1.0	1.0	4.3	4.5	01/26/87	1.1	1.0	1.0	3.7	3.8
01/27/86	1.1	1.0	1.0	4.3	4.3	01/27/87	1.1	1.0	1.0	3.8	4.0
01/28/86	1.1	1.0	1.0	4.3	4.5	01/28/87	1.0	1.0	1.0	4.0	4.2
01/29/86	1.0	1.0	1.0	4.5	5.0	01/29/87	1.1	1.0	1.0	4.1	4.2
01/30/86	1.1	1.0	1.0	5.0	5.7	01/30/87	1.1	1.0	1.0	3.7	4.1
01/31/86	1.0	1.0	1.0	5.7	6.3	01/31/87	1.0	1.0	1.0	3.9	3.9

Appendix A.2 Flows from Dworshak Dam and height of the Clearwater River at Peck, Idaho from Febuary 1986 and 1987.

Date	Flows x 1000 (cfs) High	Low	Average	Height of River Low	High	Date	Flow x 1000 (cfs) High	Low	Average	Height of River Low	High
02/01/86	1.1	1.0	1.1	6.3	6.6	02/01/87	1.0	1.0	1.0	3.9	5.2
02/02/86	1.1	1.0	1.0	6.6	6.8	02/02/87	1.1	1.0	1.0	4.5	5.3
02/03/86	1.1	1.0	1.0	6.5	6.6	02/03/87	1.1	1.0	1.0	4.4	4.5
02/04/86	1.1	1.0	1.0	6.3	6.6	02/04/87	1.1	1.0	1.0	4.3	4.5
02/05/86	1.1	1.0	1.1	6.3	6.3	02/05/87	1.1	1.0	1.0	4.2	4.3
02/06/86	1.0	1.0	1.0	5.9	6.3	02/06/87	1.1	1.0	1.0	4.1	4.2
02/07/86	1.0	1.0	1.0	5.6	5.9	02/07/87	1.0	1.0	1.0	4.1	4.2
02/08/86	1.0	1.0	1.0	5.2	5.6	02/08/87	1.0	1.0	1.0	4.1	4.2
02/09/86	1.0	1.0	1.0	4.9	5.2	02/09/87	1.0	1.0	1.0	4.1	4.2
02/10/86	1.0	1.0	1.0	4.9	5.1	02/10/87	1.0	1.0	1.0	4.1	4.1
02/11/86	1.0	1.0	1.0	5.0	5.1	02/11/87	1.0	1.0	1.0	4.1	4.1
02/12/86	1.0	1.0	1.0	4.8	5.0	02/12/87	1.1	1.0	1.0	4.1	4.2
02/13/86	1.0	1.0	1.0	4.7	4.8	02/13/87	1.1	1.0	1.0	4.2	4.4
02/14/86	1.0	1.0	1.0	4.7	4.7	02/14/87	1.0	1.0	1.0	4.4	4.9
02/15/86	1.0	1.0	1.0	4.7	5.0	02/15/87	1.0	1.0	1.0	4.8	4.9
02/16/86	1.0	1.0	1.0	5.0	6.5	02/16/87	1.0	1.0	1.0	4.7	4.8
02/17/86	1.0	1.0	1.0	6.5	6.9	02/17/87	1.0	1.0	1.0	4.7	4.7
02/18/86	1.0	1.0	1.0	6.9	7.3	02/18/87	1.1	1.0	1.0	4.7	4.7
02/19/86	1.0	1.0	1.0	6.6	7.1	02/19/87	1.1	1.0	1.0	4.6	4.7
02/20/86	1.0	1.0	1.0	6.1	6.6	02/20/87	1.0	1.0	1.0	4.4	4.6
02/21/86	1.0	1.0	1.0	5.9	6.1	02/21/87	1.0	1.0	1.0	4.4	4.4
02/22/86	1.0	1.0	1.0	5.9	6.7	02/22/87	1.0	1.0	1.0	4.4	4.4
02/23/86	1.0	1.0	1.0	6.7	10.0	02/23/87	1.0	1.0	1.0	4.3	4.4
02/24/86	1.0	1.0	1.0	10.0	11.9	02/24/87	1.0	1.0	1.0	4.2	4.3
02/25/86	1.0	1.0	1.0	11.1	11.9	02/25/87	1.0	1.0	1.0	4.1	4.2
02/26/86	1.0	1.0	1.0	10.8	11.1	02/26/87	1.0	1.0	1.0	4.1	4.1
02/27/86	6.7	1.0	4.3	10.5	11.7	02/27/87	1.0	1.0	1.0	4.0	4.1
02/28/86	7.7	1.0	5.4	10.2	11.3	02/28/87	1.0	1.0	1.0	4.0	4.0

Appendix A.3 Flows from Dworshak Dam and height of the Clearwater River at Peck, Idaho from March 1986-1987.

	Flows x 1000 (cfs)			Height of River			Flow x 1000 (cfs)			Height of River	
Date	High	Low	Average	Low	High	Date	High	Low	Average	Low	High
03/01/86	7.7	7.6	7.6	10.7	11.1	03/01/87	1.0	1.0	1.0	4.0	4.0
03/02/86	7.7	7.6	7.7	10.7	10.8	03/02/87	1.0	1.0	1.0	4.0	4.2
03/03/86	9.9	7.6	8.7	10.7	11.2	03/03/87	1.0	1.0	1.0	4.2	4.8
03/04/86	15.0	7.6	10.2	10.6	12.1	03/04/87	1.0	1.0	1.0	4.8	5.5
03/05/86	20.0	15.0	17.0	12.1	12.8	03/05/87	1.0	1.0	1.0	5.5	5.8
03/06/86	20.0	19.1	20.0	12.6	12.8	03/06/87	1.0	1.0	1.0	5.8	6.6
03/07/86	20.1	20.0	20.0	12.6	13.6	03/07/87	1.0	1.0	1.0	5.6	6.8
03/08/86	25.0	20.0	22.5	13.6	15.2	03/08/87	1.0	1.0	1.0	6.4	6.8
03/09/86	25.1	25.0	25.0	15.1	15.1	03/09/87	1.0	1.0	1.0	6.4	6.5
03/10/86	25.1	25.0	25.0	14.4	15.0	03/10/87	1.0	0.9	1.0	6.2	6.4
03/11/86	25.1	25.0	25.0	14.2	14.5	03/11/87	1.0	1.0	1.0	6.1	6.2
03/12/86	25.1	25.0	25.0	14.1	14.5	03/12/87	1.0	1.0	1.0	6.0	6.1
03/13/86	25.1	25.1	25.1	13.8	14.3	03/13/87	1.0	1.0	1.0	6.0	7.4
03/14/86	25.2	25.1	25.1	13.6	13.8	03/14/87	1.0	1.0	1.0	7.3	7.5
03/15/86	25.1	25.0	25.0	13.2	13.6	03/15/87	1.0	1.0	1.0	6.8	7.3
03/16/86	25.0	25.0	25.0	13.0	13.2	03/16/87	1.0	1.0	1.0	6.8	6.8
03/17/86	25.2	25.0	25.0	12.9	13.0	03/17/87	1.0	1.0	1.0	6.7	6.8
03/18/86	25.1	20.1	23.5	11.8	12.9	03/18/87	1.0	1.0	1.0	6.7	7.2
03/19/86	20.2	20.1	20.1	11.8	11.8	03/19/87	1.0	1.0	1.0	6.7	7.3
03/20/86	20.2	20.0	20.1	11.7	11.8	03/20/87	1.0	1.0	1.0	6.5	6.8
03/21/86	20.2	10.2	15.8	9.8	11.7	03/21/87	1.0	1.0	1.0	6.2	6.5
03/22/86	10.3	10.1	10.2	9.7	9.8	03/22/87	1.0	1.0	1.0	5.9	6.2
03/23/86	10.3	10.2	10.3	9.6	9.7	03/23/87	1.0	1.0	1.0	5.7	5.9
03/24/86	10.3	10.0	10.2	9.6	10.2	03/24/87	1.0	1.0	1.0	5.6	5.7
03/25/86	10.3	10.1	10.3	9.9	10.2	03/25/87	1.0	1.0	1.0	5.4	5.6
03/26/86	10.3	10.2	10.3	9.8	9.9	03/26/87	1.0	1.0	1.0	5.4	5.4
03/27/86	10.3	10.0	10.2	9.8	9.8	03/27/87	1.0	1.0	1.0	5.3	6.4
03/28/86	10.3	4.6	9.5	9.0	10.2	03/28/87	1.0	1.0	1.0	5.2	5.3
03/29/86	4.6	4.5	4.5	9.0	9.6	03/29/87	1.0	1.0	1.0	5.2	5.2
03/30/86	4.5	2.0	2.1	9.1	9.9	03/30/87	1.0	1.0	1.0	4.8	5.2
03/31/86	4.4	2.1	2.6	9.9	10.4	03/31/87	1.0	1.0	1.0	4.9	5.0

Appendix A.4 Flows from Dworshak Dam and height of the Clearwater River at Peck, Idaho from April 1986-1987.

Date	Flows x 1000 (cfs) High	Low	Average	Height of River Low	High	Date	Flow x 1000 (cfs) High	Low	Average	Height of River Low	High
04/01/86	10.1	4.4	8.7	10.3	11.3	04/01/87	6.6	1.0	2.7	5.0	7.1
04/02/86	10.1	9.9	10.0	11.1	11.3	04/02/87	6.5	1.0	3.0	5.1	7.3
04/03/86	10.0	10.0	10.0	10.7	11.3	04/03/87	6.5	1.0	1.3	5.4	7.2
04/04/86	10.0	2.2	9.0	9.7	11.3	04/04/87	1.0	1.0	1.0	5.7	6.2
04/05/86	2.2	2.2	2.2	8.7	10.1	04/05/87	1.0	1.0	1.0	6.2	6.3
04/06/86	2.2	2.2	2.2	8.7	10.1	04/06/87	1.0	1.0	1.0	6.3	7.0
04/07/86	10.0	2.2	3.8	8.7	10.1	04/07/87	1.0	1.0	1.0	7.0	7.4
04/08/86	9.9	2.2	3.8	8.7	10.1	04/08/87	1.0	1.0	1.0	7.3	7.4
04/09/86	9.9	2.2	3.8	9.2	11.1	04/09/87	1.0	1.0	1.0	7.2	7.5
04/10/86	9.9	2.2	3.8	9.5	10.2	04/10/87	1.0	1.0	1.0	6.9	7.2
04/11/86	9.9	2.2	3.8	9.5	11.1	04/11/87	1.0	1.0	1.0	6.9	7.7
04/12/86	2.2	1.5	1.5	9.1	9.5	04/12/87	1.0	1.0	1.0	7.2	7.6
04/13/86	1.5	1.5	1.5	8.8	9.1	04/13/87	1.0	1.0	1.0	6.9	7.2
04/14/86	9.9	1.9	3.0	8.5	10.5	04/14/87	1.0	1.0	1.0	6.8	7.0
04/15/86	9.8	1.5	2.9	8.4	10.3	04/15/87	1.0	1.0	1.0	6.8	7.0
04/16/86	9.9	1.9	4.6	8.4	10.5	04/16/87	1.0	1.0	1.0	7.0	7.5
04/17/86	9.9	2.1	6.3	8.8	10.4	04/17/87	1.0	1.0	1.0	7.4	8.2
04/18/86	9.9	2.1	7.9	8.6	10.2	04/18/87	1.0	1.0	1.0	8.1	8.7
04/19/86	9.8	6.3	9.5	10.1	10.1	04/19/87	1.0	1.0	1.0	8.0	8.6
04/20/86	6.3	6.3	6.3	9.0	10.0	04/20/87	1.0	1.0	1.0	7.6	8.0
04/21/86	9.8	2.1	4.9	8.4	9.0	04/21/87	1.0	1.0	1.0	7.5	7.6
04/22/86	9.8	2.1	4.5	8.4	11.4	04/22/87	1.0	1.0	1.0	7.4	7.8
04/23/86	9.6	2.1	3.5	10.3	12.7	04/23/87	1.0	1.0	1.0	7.8	8.7
04/24/86	9.7	2.1	3.5	10.0	11.6	04/24/87	2.1	1.1	2.1	8.7	9.9
04/25/86	2.1	1.3	1.3	9.3	10.0	04/25/87	2.1	2.1	2.1	9.8	10.4
04/26/86	1.3	1.3	1.3	9.0	9.3	04/26/87	2.1	2.1	2.1	10.2	10.7
04/27/86	9.7	2.2	6.5	9.0	10.9	04/27/87	2.1	2.1	2.1	10.3	11.8
04/28/86	9.6	2.1	6.1	9.0	10.6	04/28/87	9.5	9.4	9.5	11.8	13.0
04/29/86	9.6	2.1	6.1	9.0	10.6	04/29/87	9.5	9.5	9.5	12.7	14.2
04/30/86	9.5	2.1	3.3	8.6	10.5	04/30/87	9.5	9.5	9.5	13.8	14.4

Appendix A.5 Flows from Dworshak Dam and height of the Clearwater River at Peck, Idaho from May 1986-1987.

Date	Flows x 1000 (cfs) High	Low	Average	Height of River Low	High	Date	Flow x 1000 (cfs) High	Low	Average	Height of River Low	High
05/01/86	9.6	2.1	3.4	8.5	10.3	05/01/87	9.5	9.4	9.4	13.9	14.8
05/02/86	5.5	2.1	2.5	8.5	9.2	05/02/87	9.5	9.4	9.4	12.6	13.9
05/03/86	2.1	1.8	1.8	8.6	9.3	05/03/87	9.4	9.4	9.4	11.7	12.6
05/04/86	1.9	1.8	1.8	9.3	11.6	05/04/87	9.5	9.4	9.5	11.3	11.7
05/05/86	9.6	1.8	7.1	11.0	12.5	05/05/87	9.5	9.4	9.4	11.2	11.4
05/06/86	9.6	2.1	6.1	13.5	12.0	05/06/87	20.1	9.4	14.2	11.2	13.6
05/07/86	9.5	2.1	6.0	10.5	11.8	05/07/87	20.1	20.0	20.0	13.4	14.0
05/08/86	9.6	2.1	6.1	10.0	11.5	05/08/87	20.0	2.1	13.2	14.8	14.3
05/09/86	9.5	2.1	6.5	10.0	11.5	05/09/87	2.1	2.1	2.1	10.8	11.5
05/10/86	6.3	6.2	6.2	10.8	11.1	05/10/87	2.1	2.1	2.1	10.7	11.3
05/11/86	6.3	6.2	6.2	10.9	11.1	05/11/87	20.0	2.1	2.1	10.6	13.8
05/12/86	9.5	4.1	8.3	10.8	11.4	05/12/87	20.0	19.9	19.9	13.4	13.6
05/13/86	9.5	2.1	7.4	9.7	11.1	05/13/87	20.0	19.9	20.0	13.3	13.8
05/14/86	9.5	2.1	7.4	9.7	11.4	05/14/87	20.0	19.9	20.0	13.1	13.6
05/15/86	9.6	2.1	7.4	9.6	11.4	05/15/87	25.0	19.9	22.5	13.0	14.0
05/16/86	9.6	2.1	7.1	9.2	10.7	05/16/87	25.0	25.0	25.0	13.7	13.9
05/17/86	9.5	4.2	6.6	9.4	10.6	05/17/87	25.0	25.0	25.0	13.5	13.7
05/18/86	9.5	2.1	7.4	8.9	10.6	05/18/87	25.0	1.0	12.8	8.3	13.5
05/19/86	9.5	2.1	7.7	9.1	11.6	05/19/87	1.0	1.0	1.0	7.9	8.3
05/20/86	9.5	9.5	9.5	11.6	12.8	05/20/87	1.0	1.0	1.0	7.4	7.9
05/21/86	9.5	9.5	9.5	12.8	14.1	05/21/87	1.0	1.0	1.0	7.1	7.4
05/22/86	9.6	9.5	9.5	13.1	14.1	05/22/87	1.0	1.0	1.0	6.8	7.1
05/23/86	9.5	9.5	9.5	12.2	13.1	05/23/87	1.0	1.0	1.0	6.6	6.8
05/24/86	9.5	9.5	9.5	11.8	12.2	05/24/87	1.0	1.0	1.0	6.6	6.6
05/25/86	9.5	9.5	9.5	11.8	12.4	05/25/87	1.0	1.0	1.0	6.5	6.8
05/26/86	9.5	9.4	9.5	12.2	13.7	05/26/87	1.0	1.0	1.0	6.7	6.8
05/27/86	9.5	9.4	9.5	13.7	15.5	05/27/87	1.0	1.0	1.0	6.8	7.3
05/28/86	9.5	9.4	9.5	15.1	16.5	05/28/87	1.0	1.0	1.0	6.9	7.2
05/29/86	10.4	7.6	9.4	15.7	16.9	05/29/87	1.0	1.0	1.0	6.6	6.9
05/30/86	9.5	9.4	9.5	16.0	17.1	05/30/87	1.0	1.0	1.0	6.6	6.6
05/31/86	9.4	9.4	9.4	15.6	16.7	05/31/87	1.0	1.0	1.0	6.6	6.6

Appendix A.6 Flows from Dworshak Dam and height of the Clearwater River at Peck, Idaho from June 1986-1987.

Date	Flows x 1000 (cfs) High	Low	Average	Height of River Low	High	Date	Flow x 1000 (cfs) High	Low	Average	Height of River Low	High
06/01/86	9.4	9.4	9.4	15.1	16.4	06/01/87	1.0	1.0	1.0	6.6	8.4
06/02/86	14.1	9.4	11.6	15.1	16.0	06/02/87	1.0	1.0	1.0	6.9	7.7
06/03/86	14.1	12.0	13.0	14.6	15.5	06/03/87	1.0	1.0	1.0	6.7	6.9
06/04/86	12.1	9.4	11.1	13.7	14.7	06/04/87	1.0	1.0	1.0	6.5	6.7
06/05/86	10.2	8.0	8.9	13.6	14.3	06/05/87	1.0	1.0	1.0	6.4	6.5
06/06/86	8.0	8.0	8.0	12.8	13.9	06/06/87	1.0	1.0	1.0	6.3	6.4
06/07/86	8.0	8.0	8.0	12.2	12.8	06/07/87	1.0	1.0	1.0	6.2	6.4
06/08/86	8.0	8.0	8.0	11.8	12.2	06/08/87	1.0	1.0	1.0	6.3	6.6
06/09/86	8.9	7.2	7.8	10.9	11.8	06/09/87	2.1	1.0	1.5	6.5	6.8
06/10/86	7.4	4.2	7.1	10.1	10.9	06/10/87	2.1	2.1	2.1	6.6	6.8
06/11/86	8.5	4.2	5.5	9.8	10.8	06/11/87	5.2	1.0	3.6	6.1	7.4
06/12/86	6.4	6.3	6.4	10.1	10.3	06/12/87	4.2	2.1	3.6	6.3	6.9
06/13/86	6.4	6.3	6.3	9.8	10.2	06/13/87	3.2	2.1	2.1	6.0	6.7
06/14/86	6.2	2.1	2.1	8.6	9.8	06/14/87	2.1	1.0	2.0	5.4	5.9
06/15/86	2.1	2.1	2.1	8.4	8.6	06/15/87	4.3	2.1	3.6	5.8	6.7
06/16/86	4.6	2.1	3.8	8.3	8.8	06/16/87	2.2	2.1	2.1	5.8	6.3
06/17/86	7.3	4.5	6.0	8.7	9.2	06/17/87	8.2	1.9	2.1	6.0	6.3
06/18/86	7.3	7.2	7.3	9.0	9.2	06/18/87	5.4	2.0	4.0	6.0	7.2
06/19/86	7.3	5.4	6.4	8.4	9.0	06/19/87	5.2	2.1	4.0	6.1	7.1
06/20/86	5.4	5.3	5.4	8.0	8.4	06/20/87	3.3	2.1	2.1	5.8	6.4
06/21/86	5.3	1.1	1.2	6.5	8.0	06/21/87	2.6	2.1	2.2	5.7	5.8
06/22/86	1.1	1.1	1.1	6.3	6.5	06/22/87	2.1	2.1	2.1	5.7	5.8
06/23/86	9.5	1.1	4.7	6.3	8.5	06/23/87	2.1	2.1	2.1	5.6	5.8
06/24/86	4.2	3.5	3.7	6.9	7.6	06/24/87	2.1	2.1	2.1	5.4	5.6
06/25/86	9.4	1.0	3.5	5.8	8.4	06/25/87	4.5	2.1	3.2	5.3	6.2
06/26/86	4.2	1.0	3.3	5.8	6.9	06/26/87	4.2	2.1	3.6	5.3	6.1
06/27/86	4.2	1.0	3.2	5.7	6.8	06/27/87	2.1	1.1	1.8	4.7	5.9
06/28/86	2.9	1.0	1.0	5.5	6.4	06/28/87	2.1	1.0	1.8	4.6	5.1
06/29/86	3.1	1.0	1.5	5.4	6.2	06/29/87	2.1	1.0	1.7	4.5	5.0
06/30/86	6.4	1.0	4.5	5.5	7.3	06/30/87	1.7	1.7	1.7	4.7	4.8

Appendix A.7 Flows from Dworshak Dam and height of the Clearwater River at Peck, Idaho from July 1986-1987.

Date	Flows x 1000 (cfs) High	Low	Average	Height of River Low	High	Date	Flow x 1000 (cfs) High	Low	Average	Height of River Low	High
07/01/86	6.3	1.0	4.1	5.4	7.2	07/01/87	1.7	1.7	1.7	4.6	4.7
07/02/86	7.3	2.1	5.5	5.7	7.3	07/02/87	1.9	1.0	1.7	4.4	4.7
07/03/86	4.2	2.1	2.5	5.5	6.7	07/03/87	1.9	1.0	1.7	4.2	4.7
07/04/86	2.1	2.1	2.1	5.5	5.5	07/04/87	1.9	1.0	1.6	4.2	4.7
07/05/86	2.1	2.1	2.1	5.5	6.5	07/05/87	1.9	1.0	1.6	4.1	4.6
07/06/86	2.1	2.1	2.1	6.0	6.5	07/06/87	1.7	1.0	1.5	4.1	4.6
07/07/86	4.2	1.0	3.3	5.2	6.5	07/07/87	2.1	1.7	2.0	4.5	4.6
07/08/86	4.2	1.0	2.6	5.0	6.3	07/08/87	2.1	1.0	1.9	4.0	4.6
07/09/86	4.2	1.0	2.6	5.0	6.3	07/09/87	4.2	2.1	3.6	4.6	5.5
07/10/86	4.2	1.0	2.6	5.0	6.3	07/10/87	3.2	2.1	2.1	4.5	5.4
07/11/86	4.2	1.0	2.0	5.1	6.4	07/11/87	2.1	2.0	2.1	4.6	5.0
07/12/86	1.0	1.0	1.0	5.4	5.5	07/12/87	2.1	1.0	1.8	4.5	5.0
07/13/86	4.2	1.0	2.9	5.2	6.4	07/13/87	2.1	1.0	1.9	4.2	4.9
07/14/86	4.2	3.0	3.1	5.7	6.2	07/14/87	2.1	2.1	2.1	4.5	4.6
07/15/86	4.2	0.9	2.8	4.7	6.0	07/15/87	2.1	1.7	1.7	4.2	4.5
07/16/86	4.2	1.0	2.0	4.7	6.0	07/16/87	1.7	1.1	1.3	3.9	4.2
07/17/86	1.6	1.6	1.6	4.9	5.1	07/17/87	1.1	1.0	1.0	3.7	3.9
07/18/86	2.1	1.6	1.9	5.0	5.2	07/18/87	1.0	1.0	1.0	3.7	4.0
07/19/86	2.1	2.1	2.1	5.0	5.2	07/19/87	1.0	1.0	1.0	4.0	4.5
07/20/86	2.1	2.1	2.1	4.9	5.0	07/20/87	1.0	1.0	1.0	4.5	4.5
07/21/86	2.1	1.6	2.1	4.8	4.9	07/21/87	3.1	1.0	1.0	4.4	5.0
07/22/86	2.1	2.1	2.1	4.8	4.8	07/22/87	3.3	2.1	2.6	4.5	5.1
07/23/86	2.1	2.0	2.1	4.7	4.8	07/23/87	4.2	2.1	3.6	4.8	5.7
07/24/86	2.0	1.6	1.6	4.4	4.7	07/24/87	7.3	2.1	4.4	4.7	6.6
07/25/86	1.7	1.6	1.6	4.4	4.4	07/25/87	7.3	2.1	6.3	4.6	6.6
07/26/86	1.6	1.3	1.3	4.2	4.4	07/26/87	7.3	2.1	5.4	4.4	6.5
07/27/86	1.3	1.3	1.3	4.2	4.2	07/27/87	7.3	1.0	5.1	3.8	6.4
07/28/86	1.3	1.3	1.3	4.1	4.2	07/28/87	4.2	1.0	2.2	3.7	5.2
07/29/86	1.3	1.0	1.2	3.9	4.1	07/29/87	2.1	1.0	1.7	3.6	4.2
07/30/86	1.3	1.0	1.2	3.8	4.0	07/30/87	1.4	1.0	1.2	3.6	3.9
07/31/86	1.3	1.0	1.0	3.8	4.0	07/31/87	1.0	1.0	1.0	3.6	3.7

Appendix A.8 Flows from Dworshak Dam and height of the Clearwater River at Peck, Idaho from August 1986-1987.

Date	Flows x 1000 (cfs) High	Low	Average	Height of River Low	High	Date	Flow x 1000 (cfs) High	Low	Average	Height of River Low	High
08/01/86	1.0	1.0	1.0	3.7	3.8	08/01/87	1.0	1.0	1.0	3.6	3.6
08/02/86	1.5	1.0	1.3	3.7	4.0	08/02/87	1.0	1.0	1.0	3.5	3.6
08/03/86	1.5	1.5	1.5	4.0	4.0	08/03/87	1.0	1.0	1.0	3.4	3.6
08/04/86	1.5	1.3	1.4	3.9	4.0	08/04/87	1.0	1.0	1.0	3.4	3.4
08/05/86	1.4	1.4	1.4	3.9	3.9	08/05/87	1.0	1.0	1.0	3.4	3.4
08/06/86	1.4	1.4	1.4	3.8	3.9	08/06/87	1.0	1.0	1.0	3.3	3.4
08/07/86	1.4	1.3	1.3	3.8	3.8	08/07/87	1.0	1.0	1.0	3.3	3.3
08/08/86	1.3	1.2	1.2	3.1	3.8	08/08/87	1.0	1.0	1.0	3.3	3.3
08/09/86	1.2	1.0	1.1	3.5	3.7	08/09/87	1.0	1.0	1.0	3.3	3.3
08/10/86	1.0	1.0	1.0	3.4	3.5	08/10/87	1.0	1.0	1.0	3.2	3.3
08/11/86	2.1	1.0	1.6	3.4	4.1	08/11/87	1.0	1.0	1.0	3.2	3.2
08/12/86	1.4	1.3	1.3	3.6	3.7	08/12/87	2.1	1.0	2.1	3.2	3.9
08/13/86	1.3	1.3	1.3	3.6	3.7	08/13/87	2.1	2.1	2.1	3.9	3.9
08/14/86	1.3	1.3	1.3	3.6	3.7	08/14/87	2.1	2.1	2.1	3.9	3.9
08/15/86	1.3	1.3	1.3	3.7	3.7	08/15/87	2.1	2.1	2.1	3.9	4.1
08/16/86	1.3	0.9	1.0	3.4	3.7	08/16/87	2.1	2.1	2.1	4.1	4.2
08/17/86	1.0	1.0	1.0	3.3	3.4	08/17/87	1.0	2.1	2.0	3.7	4.2
08/18/86	1.3	1.0	1.0	3.3	3.5	08/18/87	2.1	2.1	2.1	4.1	4.2
08/19/86	1.0	1.0	1.0	3.3	3.3	08/19/87	2.1	2.1	2.1	4.0	4.1
08/20/86	2.1	1.0	1.4	3.2	3.9	08/20/87	2.1	2.1	2.1	4.0	4.0
08/21/86	2.1	2.1	2.1	3.9	3.9	08/21/87	2.1	2.1	2.1	3.9	4.0
08/22/86	2.1	2.1	2.1	3.9	4.1	08/22/87	2.0	2.1	2.1	3.9	3.9
08/23/86	2.1	2.1	2.1	4.1	4.2	08/23/87	2.1	0.0	2.0	3.9	3.9
08/24/86	2.1	2.1	2.1	4.0	4.2	08/24/87	2.1	0.0	1.7	3.2	4.0
08/25/86	2.1	1.3	1.8	3.6	4.0	08/25/87	2.1	2.1	2.1	4.0	4.1
08/26/86	1.5	1.3	1.4	3.5	3.6	08/26/87	2.1	2.1	2.1	4.0	4.0
08/27/86	1.3	1.3	1.3	3.5	3.5	08/27/87	2.1	2.1	2.1	4.0	4.0
08/28/86	2.1	1.0	1.8	3.2	3.9	08/28/87	2.3	1.9	2.1	3.8	4.0
08/29/86	2.1	1.0	1.8	3.2	3.9	08/29/87	2.1	2.1	2.1	3.9	3.9
08/30/86	2.2	1.0	1.8	3.3	4.1	08/30/87	2.1	2.1	2.1	3.9	3.9
08/31/86	2.1	2.1	1.0	3.4	4.2	08/31/87	5.2	2.1	3.5	3.8	5.4

Appendix A.9 Flows from Dworshak Dam and height of the Clearwater River at Peck, Idaho from September 1986-1987.

Date	Flows x 1000 (cfs) High	Low	Average	Height of River Low	High	Date	Flow x 1000 (cfs) High	Low	Average	Height of River Low	High
09/01/86	2.1	1.0	1.7	3.6	4.3	09/01/87	2.1	2.1	2.1	3.8	3.9
09/02/86	9.4	1.0	5.7	3.6	7.1	09/02/87	2.1	1.6	2.1	3.8	3.8
09/03/86	9.4	2.1	7.1	4.2	7.0	09/03/87	2.1	1.0	1.8	3.0	3.8
09/04/86	9.5	9.4	9.4	7.0	7.0	09/04/87	2.1	2.1	2.1	3.8	3.8
09/05/86	9.4	9.4	9.4	7.0	7.0	09/05/87	2.1	2.1	2.1	3.8	3.8
09/06/86	9.4	9.4	9.4	7.0	7.0	09/06/87	2.1	2.1	2.1	3.8	3.8
09/07/86	9.5	9.4	9.4	6.9	7.0	09/07/87	2.1	2.1	2.1	3.8	3.8
09/08/86	9.5	9.4	9.4	6.9	6.9	09/08/87	9.5	2.1	7.5	3.8	6.8
09/09/86	9.5	9.4	9.4	6.9	7.3	09/09/87	9.5	9.5	9.5	6.8	6.8
09/10/86	9.5	9.4	9.5	7.2	7.3	09/10/87	9.5	9.5	9.5	6.8	6.8
09/11/86	9.5	9.5	7.5	7.1	7.2	09/11/87	9.5	9.5	9.5	6.8	6.8
09/12/86	9.5	9.4	9.5	7.0	7.1	09/12/87	9.5	9.5	9.5	6.8	6.8
09/13/86	9.5	9.4	9.5	7.0	7.0	09/13/87	9.5	9.5	9.5	6.8	6.8
09/14/86	9.5	9.5	9.5	7.0	7.1	09/14/87	9.5	9.5	9.5	6.6	6.8
09/15/86	9.5	9.5	9.5	7.1	7.1	09/15/87	9.5	7.5	9.4	6.6	6.8
09/16/86	9.7	9.5	9.6	7.1	7.3	09/16/87	9.5	1.1	7.1	3.1	6.8
09/17/86	9.7	9.5	9.6	7.1	7.3	09/17/87	9.5	9.5	9.5	6.8	6.8
09/18/86	9.5	9.5	9.5	7.1	7.2	09/18/87	9.5	9.5	9.5	6.8	6.8
09/19/86	9.6	9.5	9.5	7.2	7.2	09/19/87	9.6	9.4	9.5	6.8	6.9
09/20/86	9.6	9.5	9.5	7.2	7.2	09/20/87	9.5	9.5	9.5	6.9	6.9
09/21/86	9.6	9.5	9.5	7.2	7.5	09/21/87	9.6	9.5	9.5	6.8	6.9
09/22/86	9.5	9.5	9.5	7.3	7.5	09/22/87	9.6	9.5	9.5	0.0	6.8
09/23/86	9.7	9.5	9.7	7.2	7.3	09/23/87	9.8	9.5	9.5	0.0	6.8
09/24/86	9.8	9.6	9.7	7.2	7.2	09/24/87	9.6	9.5	9.6	0.0	0.0
09/25/86	9.7	9.5	9.6	7.2	7.3	09/25/87	9.7	9.5	9.6	0.0	6.8
09/26/86	9.6	9.6	9.6	7.3	7.3	09/26/87	9.6	9.6	9.6	0.0	0.0
09/27/86	9.7	9.6	9.7	7.3	7.3	09/27/87	9.8	4.4	9.2	0.0	0.0
09/28/86	9.8	9.7	9.8	7.3	7.3	09/28/87	9.8	4.4	9.6	0.0	6.9
09/29/86	9.8	9.7	9.8	7.3	7.5	09/29/87	9.8	9.7	9.7	6.9	6.9
09/30/86	9.8	2.1	8.0	4.8	7.5	09/30/87	9.8	3.4	9.0	4.9	6.9

Appendix A.10 Flows from Dworshak Dam and height of the Clearwater River at Peck, Idaho from October 1986-1987.

Date	Flows x 1000 (cfs) High	Low	Average	Height of River Low	High	Date	Flow x 1000 (cfs) High	Low	Average	Height of River Low	High
10/01/86	2.2	2.1	2.2	4.8	4.9	10/01/87	3.4	1.8	1.9	3.5	4.9
10/02/86	2.2	2.1	2.2	4.8	4.9	10/02/87	1.8	1.7	1.8	3.5	3.5
10/03/86	2.4	2.1	2.2	4.6	4.8	10/03/87	1.8	1.8	1.8	3.5	3.5
10/04/86	2.2	2.1	2.1	4.5	4.6	10/04/87	1.8	1.7	1.8	3.5	3.5
10/05/86	2.5	2.1	2.2	4.4	4.5	10/05/87	1.8	1.7	1.8	3.5	3.5
10/06/86	3.1	2.5	3.1	4.4	4.9	10/06/87	1.8	1.7	1.8	3.5	3.5
10/07/86	3.2	3.1	3.2	4.8	4.9	10/07/87	1.8	1.8	1.8	3.5	3.5
10/08/86	3.2	3.1	3.1	4.8	4.9	10/08/87	1.8	1.8	1.8	3.5	3.5
10/09/86	3.1	2.1	2.4	4.3	4.8	10/09/87	2.0	1.8	2.0	3.5	3.6
10/10/86	2.1	1.9	2.0	4.2	4.3	10/10/87	2.0	2.0	2.0	3.6	3.6
10/11/86	1.9	1.8	1.8	4.1	4.2	10/11/87	2.0	2.0	2.0	3.6	3.6
10/12/86	1.8	1.8	1.8	4.1	4.1	10/12/87	2.0	2.0	2.0	3.6	3.6
10/13/86	1.8	1.8	1.8	4.1	4.1	10/13/87	2.0	1.8	1.8	3.5	3.6
10/14/86	2.1	1.8	2.0	4.1	4.2	10/14/87	1.8	1.8	1.8	3.5	3.5
10/15/86	2.2	2.1	2.1	4.2	4.2	10/15/87	1.8	1.8	1.8	3.5	3.5
10/16/86	2.2	2.1	2.1	4.2	4.4	10/16/87	1.8	1.8	1.8	3.5	3.5
10/17/86	2.2	2.1	2.1	4.2	4.2	10/17/87	2.0	1.8	2.0	3.5	3.6
10/18/86	2.1	2.1	2.1	4.2	4.2	10/18/87	2.0	2.0	2.0	3.6	3.6
10/19/86	2.1	2.1	2.1	4.1	4.2	10/19/87	2.0	2.0	2.0	3.6	3.6
10/20/86	2.1	2.1	2.1	4.1	4.1	10/20/87	2.0	2.0	2.0	3.6	3.6
10/21/86	2.1	2.1	2.1	4.1	4.2	10/21/87	2.0	2.0	2.0	3.6	3.6
10/22/86	2.2	2.1	2.1	4.1	4.2	10/22/87	2.0	2.0	2.0	3.6	3.6
10/23/86	2.1	2.1	2.1	4.1	4.1	10/23/87	2.0	2.0	2.0	3.6	3.6
10/24/86	2.2	4.1	4.1	4.1	4.1	10/24/87	2.0	2.0	2.0	3.6	3.6
10/25/86	2.1	4.1	4.1	4.1	4.1	10/25/87	2.0	2.0	2.0	3.6	3.6
10/26/86	2.1	4.1	4.1	4.1	4.1	10/26/87	2.0	2.0	2.0	3.6	3.6
10/27/86	2.1	4.1	4.1	4.1	4.1	10/27/87	2.0	2.0	2.0	3.6	3.6
10/28/86	2.1	2.1	2.1	4.1	4.5	10/28/87	2.1	2.0	2.1	3.6	3.7
10/29/86	2.1	2.1	2.1	4.5	4.5	10/29/87	2.1	2.0	2.1	3.7	3.7
10/30/86	2.1	2.1	2.1	4.4	4.5	10/30/87	2.1	2.1	2.1	3.7	3.7
10/31/86	2.2	2.1	2.1	4.5	4.8	10/31/87	2.1	2.1	2.1	3.7	3.7

Appendix A.11 Flows from Dworshak Dam and height of the Clearwater River at Peck, Idaho from November 1986-1987.

Date	Flows x 1000 (cfs) High	Low	Average	Height of River Low	High	Date	Flow x 1000 (cfs) High	Low	Average	Height of River Low	High
11/01/86	2.2	2.1	2.1	4.6	4.8	11/01/87	2.1	2.1	2.1	3.7	3.7
11/02/86	2.1	2.1	2.1	4.4	4.6	11/02/87	2.5	2.1	2.1	3.7	3.7
11/03/86	2.1	2.1	2.1	4.3	4.4	11/03/87	2.1	2.1	2.1	3.7	3.8
11/04/86	2.1	2.1	2.1	4.3	4.3	11/04/87	2.1	2.1	2.1	3.8	3.8
11/05/86	2.1	2.1	2.2	4.3	4.3	11/05/87	2.1	2.1	2.1	3.7	3.8
11/06/86	2.1	2.0	2.1	4.3	4.9	11/06/87	2.1	2.1	2.1	3.7	3.7
11/07/86	2.2	2.1	2.1	4.8	4.8	11/07/87	2.1	2.1	2.1	3.7	3.7
11/08/86	2.1	2.1	2.1	4.6	4.8	11/08/87	2.1	2.1	2.1	3.7	3.7
11/09/86	2.1	2.1	2.1	4.5	4.6	11/09/87	2.2	2.1	2.1	3.7	3.7
11/10/86	2.1	2.1	2.1	4.4	4.5	11/10/87	2.1	2.1	2.1	3.7	3.7
11/11/86	2.2	2.1	2.1	4.3	4.4	11/11/87	4.2	2.1	3.9	3.7	5.0
11/12/86	2.2	2.1	2.1	4.3	4.3	11/12/87	4.6	4.4	4.5	4.9	5.0
11/13/86	2.1	2.1	2.1	4.3	4.5	11/13/87	4.5	4.4	4.4	5.0	5.1
11/14/86	2.1	2.1	2.1	4.4	4.5	11/14/87	4.6	4.4	4.5	5.1	5.3
11/15/86	2.1	2.1	2.1	4.5	4.8	11/15/87	4.5	4.4	4.5	5.3	5.4
11/16/86	4.3	2.1	2.4	4.7	5.6	11/16/87	10.1	4.4	8.0	5.3	7.2
11/17/86	9.4	4.2	4.9	5.6	7.5	11/17/87	9.9	7.7	9.6	6.3	7.1
11/18/86	9.9	9.3	9.6	7.5	9.6	11/18/87	10.1	9.9	9.9	7.0	7.1
11/19/86	9.9	9.8	9.8	7.6	7.7	11/19/87	10.0	9.9	9.9	7.0	7.0
11/20/86	9.9	9.9	9.9	7.7	7.8	11/20/87	10.0	9.9	9.9	7.0	7.0
11/21/86	9.9	9.9	9.9	7.4	8.3	11/21/87	9.9	7.7	7.8	6.3	7.0
11/22/86	9.9	9.8	9.9	8.2	8.4	11/22/87	7.8	7.7	7.7	6.3	6.3
11/23/86	9.9	9.9	9.9	8.0	8.2	11/23/87	7.8	7.7	7.7	6.3	6.3
11/24/86	9.9	9.8	9.9	8.0	8.0	11/24/87	7.8	5.5	5.6	5.5	6.3
11/25/86	9.9	2.2	8.9	9.9	8.1	11/25/87	5.6	5.5	5.6	5.5	5.6
11/26/86	2.2	1.0	1.0	4.8	5.9	11/26/87	5.6	5.5	5.6	5.5	5.5
11/27/86	1.0	1.0	1.0	4.7	4.8	11/27/87	5.6	5.6	5.6	5.5	5.5
11/28/86	1.0	1.0	1.0	4.7	5.2	11/28/87	5.6	5.5	5.6	5.5	5.5
11/29/86	1.0	1.0	1.0	4.9	5.1	11/29/87	10.1	5.6	6.5	5.5	7.0
11/30/86	1.0	1.0	1.0	4.7	4.9	11/30/87	10.2	10.0	10.1	7.0	7.0

Appendix A.12 Flows from Dworshak Dam and height of the Clearwater River at Peck, Idaho in January 1986.

Date	Flows x 1000 (cfs) High	Low	Average	Height of River Low	High
12/01/86	9.9	1.0	3.2	4.5	7.6
12/02/86	9.9	9.9	9.9	7.6	7.6
12/03/86	9.9	9.9	9.9	7.6	7.6
12/04/86	10.0	9.9	9.9	7.5	7.6
12/05/86	10.0	9.9	9.9	7.5	7.5
12/06/86	10.0	9.9	10.0	7.5	7.7
12/07/86	10.0	9.9	9.9	7.6	7.7
12/08/86	10.0	9.9	10.0	7.6	7.6
12/17/86	10.2	10.0	10.1	7.3	7.4
12/18/86	10.3	8.0	9.7	6.4	7.3
12/19/86	8.0	7.8	8.0	6.4	6.5
12/20/86	7.8	5.7	5.7	5.6	6.4
12/21/86	5.7	5.7	5.7	5.7	5.8
12/22/86	10.4	5.7	9.3	5.8	7.4
12/23/86	10.4	5.8	10.0	6.6	7.5
12/24/86	5.8	2.1	5.4	4.9	6.6
12/25/86	2.6	2.3	2.3	4.6	4.9
12/26/86	2.3	2.3	2.3	4.5	4.6
12/27/86	2.3	2.3	2.3	4.4	4.5
12/28/86	2.3	2.3	2.3	4.2	4.4
12/29/86	2.4	2.3	2.3	4.1	4.2
12/30/86	2.3	2.3	2.3	4.1	4.3
12/31/86	2.3	2.3	2.3	4.3	4.4

Appendix A.13 Mean monthly flows from Dworshak Dam and height of the Clearwater River at Peck, Idaho from January 1986 to November 1987.

Month	Average Flow	Average High Flow	Average Low Flow	Average High Height	Average Low Height
January	1.76	2.09	1.38	5.03	4.52
Febuary	1.28	1.46	1.00	7.17	6.59
March	16.08	16.86	15.29	12.08	11.56
April	4.85	8.14	2.88	10.51	9.18
May	7.32	8.73	5.25	12.45	11.28
June	5.73	7.07	4.73	10.18	9.29
July	2.19	2.87	1.50	5.50	4.89
August	1.42	1.58	1.31	3.83	3.57
September	8.95	**9.33**	8.43	7.11	6.71
October	2.45	2.26	2.39	4.41	4.30
November	4.06	4.37	3.78	5.79	5.49
December	6.94	7.50	6.40	6.36	6.05
January	1.31	1.40	1.29	3.82	3.60
Febuary	1.00	1.03	1.00	4.45	4.29
March	1.00	1.00	1.00	6.10	5.75
April	2.13	2.55	1.96	8.55	7.83
May	8.35	9.83	7.37	10.69	9.99
June	2.10	2.70	1.57	6.41	5.86
July	2.22	2.82	1.39	4.91	4.22
August	1.74	1.78	1.53	3.84	3.68
September	7.61	7.85	6.59	5.44	4.19
October	1.94	1.99	1.90	3.60	3.54
November	5.26	5.67	4.96	5.35	5.08

Appendix B.l. Land use classification descriptive criteria and conditions pertaining to each category of land use (USACE, 1985).

a. Project Operations

These lands were acquired for project construction and for operation and maintenance of project structures or for care and management of project lands. Recreation and wildlife habitat management will be permitted when not in conflict with the basic project requirements. Controlled public access to broaden public understanding and appreciation of project purposes and functions is allowed unless otherwise restricted for physical security reasons or to reduce conflicts between public and project operation activities.

b. Log Handling

These lands are currently leased or available for lease agreements to states, political subdivisions thereof, or private firms under provisions of Section 108 of Public Law 86-645. Their purpose is for the development of private log-handling industrial activities and storage facilities requiring close association with the water surface of the reservoir.

c. Log-Handling Future

These frontage areas are reserved for log-handling activities which may occur in the future. The sites have been chosen in relation to potential timber productive areas off project land and existing and future road systems servicing the area. Low-Density recreation and wildlife habitat management measures may be allowed on an interim basis on these lands.

d. Recreation Intensive Use

These are lands on which facilities now exist or will be developed during the next 5 years to meet recreation visitor needs in concentrated numbers. Intensive use lands, including developed facilities thereon, will be administered under lease agreements by state or local agencies or commercial concessioners. Joint use of these lands for wildlife management will be permitted. Vegetation manipulation for scenic enhancement, restoration, and erosion control will be permitted. Measures leading to habitat improvement for the benefit of wildlife may be performed on these lands not actually occupied by formal facility development insofar as such habitat improvements are compatible with recreation values.

e. Recreation Intensive Use - Future

These are lands having development potential as Recreation Intensive Use lands and arc reserved for future use as recreation needs warrant. Low-density recreation activities may occur at these sites until intensive development takes place. Wildlife habitat improvement measures are permitted as a joint use, provided such use will not adversely affect the basic recreation values. This interim use must be of such a nature that it can be terminated without adverse effects and the land be made available for the purpose for which it is reserved.

f. Recreation Low Density

The purpose of these shoreline lands is to allow a dispersed visiting public an area to participate in recreation activities. These activities may include, but not be limited to, ecological workshops and forums, hiking and horseback riding, primitive camping, or similar activities which play a significant role in facilitating public enjoyment of the project. Limited facilities such as benches, tables, sun shelters, vault toilets, and fire grills will be allowed. Utilities will not be provided in low-density areas. All such facilities will be in harmony with the natural surroundings so as.not to be intrusive to the

environment. Landscaping or restoration, when necessary, will utilize plants native or naturalized to the area. Measures leading to habitat improvement for the benefit of wildlife will be permitted.

g. Wildlife Management - Intensive

These lands are classified for wildlife management-intensive because of their inherent value as wildlife habitat or because of their potential for specific management practices. These practices may be of an intensive nature which have been or will be implemented to improve or maintain habitat beneficial to various forms of wildlife, both game and nongame. Lands classified in this category at Dworshak may receive extensive manipulation of vegetation (such as rolling and burning to rejuvenate brush fields) for big-game winter range. The lands, including developments and improvements thereon, will be developed in cooperation with Federal or state fish and wildlife agencies to reach mitigation agencies goals established for the Dworshak project. Wildlife management lands will be available generally on a continuous basis for low-density recreation activities such as hiking, primitive camping, nature study, nature photography, bird watching, hunting, fishing and other related activities. These-lands will be developed and

administered by the Corps of Engineers or will be administered under a management agreement with Federal or state fish and wildlife agencies. Habitat on these lands is currently managed by the Corps through a cooperative agreement with IDFG.

h. Wildlife Management - Moderate

Generally, habitat improvements designated for these lands will not include extensive vegetation manipulation. All management activities will be designed to be compatible with aesthetic and recreation values. Habitats will be improved and maintained for a wide spectrum of wildlife species inhabiting project lands.

1. Natural Area

These lands have been classified for preservation of ecological and scenic values. Normally, limited or no development will be permitted on land in this classification. Access will be provided by hiking and bridle paths which will be designed to have minimum adverse impacts on scenic qualities. Vehicles will not be allowed (except in emergency situations) nor benches, shade, shelters, tables, utilities, or other structures not directly related to access or control of access through the area. Interpretive facilities and signs

will be restricted to the periphery of the area, be subdued, and kept to a minimum. Preservation will be the primary objective in management of these lands, with all other uses being regulated to this end.

j. National Forest land

These lands were acquired for impoundment of Dworshak Reservoir but have since been returned to the Forest Service. The Forest Service has management responsibilities for these lands.

Appendix C.1 Land area, acres, of 3 cover types on islands and selected shorelines along the lower Clearwater River. Values to the right of the acreages in parentheses are the proportion of each cover type. Areas were deliniated from black and white aerial photographs at a scale of 1:4100 on September 6, 1960. The average flow for that day was 3980 cfs.

Island Description	Island #	Annually Flooded	Semi-permenant Cover	Permenant Cover	Total Area (ac)
Lower Hog	1	4.46 (0.26)	12.08 (0.70)	0.81 (0.05)	17.35
S. of Lower Hog	2	5.02 (0.78)	1.42 (0.22)	0.00 (0)	6.44
S. of Lower Hog	3	4.51 (0.86)	0.72 (0.14)	0.00 (0)	5.24
Upper Hog	4	11.12 (0.34)	14.77 (0.45)	7.20 (0.22)	33.08
E. of Hwy 95 bridge	5	11.38 (0.74)	3.97 (0.26)	0.00 (0)	15.36
W. of Spaulding Bridge	6	0.30 (1.00)	0.00 (0)	0.00 (0)	0.30
W. of Spaulding Bridge	7	0.32 (1.00)	0.00 (0)	0.00 (0)	0.32
W. of Spaulding Bridge	8	0.13 (1.00)	0.00 (0)	0.00 (0)	0.13
W. of Turkey Island	9	14.58 (0.81)	3.41 (0.19)	0.00 (0)	17.99
Turkey Island	10	18.45 (0.41)	8.14 (0.18)	18.69 (0.41)	45.27
Mouth of Potlach Cr.	11	3.28 (0.74)	1.13 (0.26)	0.00 (0)	4.41
River Mile 17	12	5.96 (0.41)	7.95 (0.55)	0.56 (0.04)	14.47
Mrytle Beach	13	11.20 (0.94)	1.02 (0.09)	0.00 (0)	11.95
S. gravel bar RM 19	14	7.73 (1.00)	0.00 (0)	0.00 (0)	7.73
N. gravel bar RM 19	15	8.57 (1.00)	0.00 (0)	0.00 (0)	8.57
W. island at RM 20	16	22.21 (0.80)	5.48 (0.20)	0.00 (0)	27.68
Mid. island at RM 20	17	4.48 (0.34)	8.59 (0.66)	0.00 (0)	13.08
E. island at RM 20	18	16.41 (0.64)	5.56 (0.22)	3.68 (0.14)	25.64

Appendix C.2 Land area, acres, of 3 cover types on islands and selected shorelines along the lower Clearwater River. Values to the right of the acreages in parentheses are the proportion of each cover type. Areas were deliniated from black and white aerial photographs at a scale of 1:12,000 on August 15, 1973. The average flow for that day was 3980 cfs.

Island Description	Island #	Annually Flooded	Semi-permenant Cover	Permenant Cover	Total Area (ac)
Lower Hog	1	6.20 (0.27)	16.99 (0.73)	0.00 (0)	23.19
S. of Lower Hog	2	0.00 (0)	12.17 (1.00)	0.00 (0)	12.17
S. of Lower Hog	3	2.30 (1.00)	0.00 (0)	0.00 (0)	2.30
Upper Hog	4	9.41 (0.25)	15.38 (0.42)	12.17 (0.33)	36.97
E. of Hwy 95 bridge	5	14.24 (0.93)	1.15 (0.07)	0.00 (0)	15.38
W. of Spaulding Bridge	6	0.46 (0.50)	0.46 (0.50)	0.00 (0)	0.92
W. of Spaulding Bridge	7	0.46 (1.00)	0.00 (0)	0.00 (0)	0.46
W. of Spaulding Bridge	8	0.23 (0.33)	0.46 (0.67)	0.00 (0)	0.69
W. of Turkey Island	9	18.14 (0.84)	3.44 (0.16)	0.00 (0)	21.58
Turkey Island	10	14.24 (0.26)	21.81 (0.40)	19.06 (0.35)	55.10
Mouth of Potlach Cr.	11	1.38 (0.27)	3.67 (0.73)	0.00 (0)	5.05
River Mile 17	12	3.21 (0.2)	12.86 (0.8)	0.00 (0)	16.07
Mrytle Beach	13	8.04 (0.71)	3.21 (0.29)	0.00 (0)	11.25
S. gravel bar RM 19	14	6.43 (1.00)	0.00 (0)	0.00 (0)	6.43
N. gravel bar RM 19	15	8.27 (1.00)	0.00 (0)	0.00 (0)	8.27
W. island at RM 20	16	18.14 (0.76)	5.74 (0.24)	0.00 (0)	23.88
Mid. island at RM 20	17	1.15 (0.09)	11.25 (0.91)	0.00 (0)	12.40
E. island at RM 20	18	5.97 (0.25)	12.40 (0.53)	5.05 (0.22)	23.42

Appendix C.3 Land area, acres, of 3 cover types on islands and selected shorelines along the lower Clearwater River. Values to the right of the acreages in parentheses are the proportion of each cover type. Areas were deliniated from color aerial photographs at a scale of 1:15,840 on August 24, 1982. The average flow for that day was 4390 cfs.

Island Description	Island #	Annually Flooded	Semi-permenant Cover	Permenant Cover	Total Area (ac)
Lower Hog	1	6.80 (0.27)	18.00 (0.73)	0.00 (0)	24.80
S. of Lower Hog	2	3.60 (0.30)	8.40 (0.70)	0.00 (0)	12.00
S. of Lower Hog	3	0.40 (0.13)	2.80 (0.88)	0.00 (0)	3.20
Upper Hog	4	4.40 (0.13)	14.40 (0.42)	15.20 (0.45)	34.00
E. of Hwy 95 bridge	5	2.40 (0.17)	12.00 (0.83)	0.00 (0)	14.40
W. of Spaulding Bridge	6	0.80 (0.5)	0.80 (0.50)	0.00 (0)	1.60
W. of Spaulding Bridge	7	0.40 (1.00)	0.00 (0)	0.00 (0)	0.40
W. of Spaulding Bridge	8	0.00 (0)	2.40 (1.00)	0.00 (0)	2.40
W. of Turkey Island	9	6.00 (0.27)	15.60 (0.70)	0.80 (0.04)	22.40
Turkey Island	10	3.20 (0.06)	8.00 (0.16)	39.60 (0.78)	50.80
Mouth of Potlach Cr.	11	0.40 (0.07)	5.20 (0.93)	0.00 (0)	5.60
River Mile 17	12	0.80 (0.05)	14.80 (0.95)	0.00 (0)	15.60
Mrytle Beach	13	2.40 (0.22)	7.60 (0.70)	0.00 (0)	10.80
S. gravel bar RM 19	14	6.00 (0.71)	2.40 (0.29)	0.00 (0)	8.40
N. gravel bar RM 19	15	4.40 (0.58)	3.20 (0.42)	0.00 (0)	7.60
W. island at RM 20	16	3.60 (0.14)	16.40 (0.65)	5.20 (0.21)	25.20
Mid. island at RM 20	17	0.00 (0)	12.00 (1.00)	0.00 (0)	12.00
E. island at RM 20	18	4.80 (0.21)	12.80 (0.57)	4.80 (0.21)	22.40

Appendix D.l Species occurrence within 3 major cover types along the lower Clearwater River Idaho (Ashrin and Orme 1978). Y = year-round resident, S = summer resident, W= winter resident, and M = fall or spring resident.

Species	Open Water	Non-Vegetated	Cover Types Semi-permenant	Permenant
Common Loon	M			
Horned Grebe	Y			
Wetern Grebe	M			
Pied-billed Grebe	Y			
Eared Grebe	M			
American Coot	Y			
Great Blue Heron	Y	Y	Y	
Black-crowed Night Heron			S	S
Whistling Swan	S M			
Canada Goose	Y	Y	Y	
Mallard	Y	M	S	
Gadwall	W M			
Pintail	W M	M		
Green-winged Teal	Y			
Blue-winged Teal	Y		S	
Cinnamon Teal	S M		S	
American Wigeon	Y	M		
Northern Shoveler	Y			
Wood Duck	Y			
Redhead	Y			
Canvasback	W M			
Ring-necked Duck	W M			
Greater Scaup	M			
Lesser Scaup	S M			
Common Goldeneye	Y			
Barrow's Goldeneye	Y			
Ruddy Duck	S			
Bufflehead	W M		S	
Hooded Merganser	W			
Common Merganser	Y			
Red-tailed hawk			Y	
Golden Eagle			Y	
Bald Eagle	W			
Marsh Hawk			W	
Osprey	S M			
American Kestral			Y	Y
California Quail			Y	Y
Mountain Quail			W	M
Ringnecked Pheasant			Y	Y
Chukar			S	S
Gray Partridge			Y	Y
Killdeer			Y	S
Spotted Sandpiper		S	S	S

Appendix D.l (con't)

Semipalmated Plover		S		
Western Sandpiper		M		
American Avocet	S	S		
Lesser Yellowlegs		S		
Herring Gull	M	W		
California Gull	S	S M		
Ring-billed Gull		S M		
Bonaparte's Gull	M			
Forster's Tern		S		
Rock Dove		S	Y	Y
Mourning Dove		W	Y	S
Long-eared Owl				W
Common Nighthawk		S		
Vaux's Swift				M
Calliope Hummingbird			S	
Belted Kingfisher	Y		Y	Y
Common Flicker			W	Y
Lewis' Woodpecker			S	S
Eastern Kingbird			S M	
Western Kingbird			S	
Western Wood Peewee			S	S
Horned Lark			S	
Violet-green Swallow	S M			
Tree Swallow	M			
Bank Swallow			S	
Rough-winged Swallow	S M			
Barn Swallow			S	
Cliff Swallow	S		S	S
Black-billed Magpie			Y	S
Common Raven				M
Common Crow			W	
Black-capped Chickadee			Y	Y
Dipper	W			
House Wren				S
Canon Wren			S M	
Rock Wren		S	S	
Gray Catbird				S
American Robin			S	S
Golden-crowned Kinglet				W
Ruby-crowned Kinglet				S
Cedar Waxwing			W	W
Starling			S	S
Solitary Vireo				S
Yellow Warbler			S	S
Yellow-rumped Warbler				S W
MacGillivray's Warbler				S
yellow-breasted Chat			S	S
House Sparrow		S	Y	S
Western Meadowlark			Y	
Red-winged Blackbird			Y	S
Northern Oriole			S	S

Appendix D.l (con't)

Brewer's Blackbird		S	S
Brown-headed Cowbird		S	S
Purple Finch		S	
Cassin's Finch			S
House Finch	M	W	S
Pine Siskin			S
Lazuli Bunting		S	S
Evening Grosbeak		S	S
American Goldfinch		S M	S
Rufous-sided Towhee			S
Black-headed Grosbeak		S	S
Chipping Sparrow			S
Song Sparrow		Y	Y
Lark Sparrow		S	
White-crowned Sparrow		W M	
Fox Sparrow		W	
Golden-crowned Sparrow		M	
Savannah Sparrow			W
Dark-eyed Junco		W M	

Appendix E.l Species occurrence within 3 major cover types along the lower Clearwater River Idaho (Ashrin and Orme 1978). Y = year-round resident, S = summer resident, W = winter resident, and M = fall or spring resident.

Mammal Species	Cover Types			
	Open Water	Non-Vegetated	Semi-permenant	Permenant
Vagrant Shrew			Y	Y
Longtail Vole			Y	Y
Mountain Vole			Y	Y
House Mouse		Y	Y	
Beer Mouse		Y	Y	Y
Western Harvest Mouse			Y	
Bushytail Woodrat			Y	
Norway Rat			Y	Y
Idaho Pocket Gopher			Y	
Yellow Pine Chipmunk				Y
Redtail Chipmunk				Y
Yellowbelly Marmot			Y	
Porcupine				Y
Beaver	Y	Y	Y	
Muskrat	Y	Y	Y	
Mountain Cottontail			Y	Y
Stipped Skunk		Y	Y	Y
Spotted Skunk		Y	Y	Y
Longtail Weasel		Y	Y	
Mink	Y	Y	Y	
River Otter	Y	Y	Y	
Coyote		Y	Y	Y
Bobcat			Y	Y
Raccoon		Y	Y	Y
Badger				Y
Mule Beer			Y	Y
White-tailed Deer			Y	Y
Elk				W

Appendix F. List of individuals which were sent copies of the Loss Statement for Dworshak Dam and the lower Clearwater River compiled by the Net Perce Tribe Wildlife Program.

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MEETING NOTES
Dworshak Work Group
February 18, 1988

0945 - Mary Mahaffey starts meeting
* sign-up list sent around

0950 - Jerome Hansen - IDFG - Loss Statement Presentation.
- handout on summary phase I loss statement
* slides of pre inundation North **Fork Clearwater River**
- Review of habitat/species losses following handout
- Questions raised about what the 1000 deer loss # means
- Ted explains the "1000" as 1000 less deer in the population post construction
* Dick questions the 915 elk "loss" by saying 915 was a "goal" for mitigation agreed upon by the Corp & State, not an agreement on what was lost.
- Allyn stated that numbers are not preferred but are required by BPA in the contract
- Final draft will remove number acres for waterfowl and aquatic furbearers
* IDF&G does not intimate that they plan on mitigating for elk mitigation in reference to piliated woodpecker
* Keith did not realize a HEP was required for all target species
- Marty clarified purpose of meeting terms of all target species
- Presentation did not include any mitigation goals although during break Allyn said they had been completed.
- Dworshak Master Plan final due out early 1989. Will address wildlife mitigation, elk and others?
* Mike Passmore states that COE have focused on elk but not to the exclusion of other species.

1032 Break for 15 minutes

1057 Loren Kronemann - NPT - Loss Statement Presentation
- documents with slides
  1. changes on pool
  2. changes in flow & temperature
  3. cover change on islands
- Overheads of impacts and goals
  - Osprey affected below dam due to loss in primary production
  - Mule deer low impact, recommend removal from list
  - White-tail? impact leave on the list
  - Goals presented as tenative
  - All comments have not been received
  - Allyn questioned if suckers were a part of the target species. Agreement was that they were removed from the **list at a previous** meeting

- Signe questioned if impacts & goals had been assessed by the work group
- Allyn questions about being able to comment on impact & goals also wanted to clarify mule deer and white-tail impacts and goals
- Keith recommends dropping: great blue heron
  mule deer
- Allyn recommends removing both mule and whitetail due to no impact
- Signe questions about impact about specific species, and states she has literature showing Canada goose and mallards breeding as positively affected by shrub & tree succession. She also has limnological studies which may be pertinent to the lower Clearwater River.
- Corps suggested creating island with dredge material
- Signe questions the impact of high "-" on bald eagles on the pool.
- Allyn questions what the Tribe recommends for additional-information and procedures.

1220 Break for lunch

1338 Keith Lawrence NPT Presentation of future direction for Technical Group and Mitigation Planning

- Comment extension period possible - May
- Review with handouts of Columbia River Basin Fish & Wildlife Program
  - Suggest agreements as one process for developing mitigation, must be agreed upon by all interested parties
- Presents the negotiation rules used in Montana Mitigation
- Request direction from work group as to what is needed for added infamation **or** can the group agree on the technical information presented.
- HEP may be appropriate depending on the needs the group feels are evident.

1405 Allyn Meuleman presentation of future procedures

- Agreed on HEP at past meeting, October.
- Review of language in the Power Planning Act.
- Only difference in IDF&G opinion between negotiation and the HEP process is that BPA will fund planning with a full process
- Review of language in the CRB Wildlife Plan

IDFG has draft work statement to present

Keith - reiterates Mary told him that it would be inappropriate to bring a draft work statement to the meeting and asks if Allyn's is appropriate now.

Mary - Clarifies she knew nothing about Allyn's draft statement and assumes it is only Allyn's way of graphically delineating her ideas.

Allyn - work statement represents idea that there should only be one author writing one report for mitigation planning.
Mike - COE
HEP takes much longer than 4 weeks if the author is to make it statistically sound and test the model.
Marty - funding could be made available for process designed to achieve agreement.

1424 Jerome present overview of HEP process with USFW slide show.

- Allyn (IDFG) believes HEP is the best technical basis for determining losses and projecting mitigation values by species.

1445 End of presentation, begin group discussion.

Signe said lower Snake River Project could not mitigate based on numbers and turned to HEP, she supported.

Mike - COE - believes 4 weeks is too short and suggest if it was that abbreviated that the work group could probably just sit down and develop just as good a plan

Marty - is HEP needed by NPPC? Does not know. Details what may happen.

Mike - COE - **Agrees** the HEP with multi cover is very complex and time consuming

Marty clarified the agreement section of 1004 (b) 2 as to what could be funded from BPA. He projects that the earliest money could be put on the ground would be 1993 or 1994 if another 12 months is added into Planning from August, 1988.

Roy - 1988 base 38.2 million
1990 base 51-54 million (and it is set, cannot be changed)

Discussion of time frame and its implications

Keith asked for info from USFW and group for Loss Statement and the uses of HEP.

HEP could be used as agreement type of process.

Mary - How to lay out contract so that there is one document?

- Keith stated 2 years ago BPA requested 2 seperate contracts because they could not accept a joint work statement. Then 2 months ago the SCOR, BPA, told both contractors that the documents did not need to be combined **for** the Loss Evaluation.

Dick - Concerned about time frame for comments on draft
- recommended extension of contract time period to incorporate changes discussed in the meeting.

- COE would like to review final copy going to BPA and comment on it.

Mary - explained the extra comment period was eliminated from the current contracts.

Roy - reviewing State & Tribes BPA contracts points out that extra comment period is in the work statement and that all comments were to go to BPA first.

Marty suggests a final review after BPA receives the reports and then BPA can incorporate the comments by attachment on the back of the reports.

Mary summarizes

1. More data is needed
2. HEP will provide the information
3. HEP would be identified in a new work statement with mitigation plan.

Allyn gathering votes on the use of HEP in general but vote was never completed.

Signe offered to get HEP instructors to come up to this area and put on training.

Keith endorsed offer of training locally.

Mary could not give out dollar amounts for Phase II budgeted by BPA but monies are available in FY 88 for Phase II.

1630 end of meeting

SIGN UP SHEET

Name	Organization
Jack Bell	Nez Perce Tribe
Signe Sather-Blair	U.S. Fish & Wildlife Serv.
Dick Giger	"
Mary Mahaffey	BPA-Portland
Albert Sutlick	COE - Walla Walla
Dick Moore	COE - Dworshak
Dean Johnson	IDL
Ted Meske	IDFG - Lewiston
Dan Davis	USFS-Orofino
Jerome Hanson	IDFG - Boise
Loren A. Kronemann	Nez Perce Tribe
Jerry Neufeld	IDFG-Coeur d'Alene
Allyn Meuleman	IDFG-Boise
Marty Montgomery	NPPC
Elliott L, Moffett	Nez Perce Tribe
Keith Lawrence	"
Chuck Kaudy	"
Darrell V. McClellan	BIA
Jim Kosciuk	BIA
Mike Passmore	COB-Dworshak
Owen Mason	COE-Walla Walla
Roy H. Sampsel	COE-Portland
	NPT

Minutes
of
Dworshak Reservoir Wildlife Protection, Mitigation, and Enhancement Planning Consultation/Coordination Meeting

February 18, 1988
Lewiston, Idaho

The following people attended:

Name	Agency
Jack Bell	Nez Perce Tribe
Dan Davis	U.S. Forest Service
Dick Giger	U.S. Fish and Wildlife Service
Jerome Hansen	Idaho Department of Fish and Game
Dean Johnson	Idaho Department of Lands
Chuck Kaudy	Bureau of Indian Affairs
Jim Koscluk	U.S. Army Corps of Engineers
Loren A. Kronemann	Nez Perce Tribe
Keith Lawrence	Nez Perce Tribe
Mary Mahaffy	Bonneville Power Administration
Owen Mason	U.S. Army Corps of Engineers
Darrell V. McClellan	Bureau of Indian Affairs
Ted Meske	Idaho Department of Fish and Game
Allyn Meuleman	Idaho Department of Fish and Game
Elliot L. Moffett	Nez Perce Tribe
Marty Montgomery	Northwest Power Planning Council
Dick Moore	U.S. Army Corps of Engineers
Jerry Neufeld	Idaho Department of Fish and Game
Mike Passmore	U.S. Army Corps of Engineers
Roy H. Sampsel	Nez Perce Tribe
Signe Sather-Blair	U.S. Fish and Wildlife Service
Al Sutlick	U.S. Army Corps of Engineers

The major objectives of the meeting were to go over the results of the Phase I Dworshak Wildlife Impact Assessments (both above and below Dworshak dam), and to decide the direction of Phase II Wildlife Protection, Mitigation, and Enhancement Planning at Dworshak. The following is a brief summary of information presented and discussed at this meeting. These minutes have been prepared concurrent with meeting notes prepared by the Nez Perce Tribe.

Introduction

Mary Mahaffy, Bonneville Power Administration, outlined objectives of the meeting to the work group. Introductions were conducted.

R4GM21SA

Results of IDFG Portion of Wildlife Impact Assessment

A summary of the results of the IDFG portion of the impact assessment was handed out to each person in attendance at the meeting. IDFG reiterated that the Phase I report was prepared only from existing information, as stipulated in the contract with Bonneville Power. Pre- and post- Dworshak Reservoir slides were shown to the work group. It was pointed out that wildlife impacts were examined on all 47,905 acres of Dworshak/USACE project lands. This acreage figure included 16,970 acres of inundated area and 30,935 acres of surrounding project lands. The impacts of the Dworshak project on each of the ten target wildlife species were presented on the handout and discussed by the work group. Impacts were reported as habitat acreage lost or changed. Few qualitative measurements were found in existing information. The estimated number of deer and elk lost (from existing information) was presented to the work group. The use of these numbers was questioned by work group members, because they thought we were staying with a habitat approach. It was pointed out that BPA had requested estimates of animals lost if the information existed.

Elk, white-tailed deer, black bear, ruffed grouse, and pileated woodpeckers all suffered substantial losses of habitat. The yellow warbler, which was used as an indicator species for nongame birds which relied on scrub/shrub/willow and red alder habitat types, lost about 66 acres of habitat. It was pointed out to the work group that not enough pre- and post-construction data existed to measure impacts to waterfowl (mallard and Canada geese) and aquatic furbearers (river otter and beaver).

The presentation ended with an outline of additional information needed. It was felt that the Habitat Evaluation Procedure (HEP) should be conducted on the target species during Phase II mitigation planning to create standardized, manageable units of measure reflecting both quantity and quality of habitat impacted.

Based on preliminary browse production estimates, a total of 563,028 pounds of browse is expected to be produced annually on Dworshak project lands by the year 1994. This will account for about one third of the elk mitigation goal of 1.8 million pounds of annual browse production. Based on interagency comments on the draft wildlife impact assessment, there is a concern that thermal or security cover may now be a limiting factor for elk in the area, due to the tremendous amount of timber harvest on state and Potlatch project lands surrounding Dworshak project lands. These issues will need to be examined during Phase II Mitigation Planning. IDFG stated that other than for elk, no specific mitigation has been undertaken for any target species at Dworshak.

Results of Nez Perce Portion of Wildlife Impact Assessment

Slides were shown to illustrate habitat changes in the Dworshak pool area, in the water flow and temperature, and in the riparian vegetation on the lower Clearwater.

The presentation included estimated impacts to bald eagles and osprey, above and below the dam, and impacts to beaver, Canada goose, mallard, great blue heron, yellow warbler, chukar, and California quail below the dam. Impacts were qualified as low +, moderate +, and high +, or low -, moderate -, or high -. Because there was essentially no impact to mule deer (low -), it was suggested by the Nez Perce Tribe that it be deleted as a target species. Impact ratings received for other target species included breeding bald eagle (high -), osprey on the reservoir (low +), osprey along the lower Clearwater River (high -), white-tailed deer (low -), river otter (moderate -), beaver (low +), Canada goose breeding (moderate -), wintering mallard (low +), great blue heron (low +), yellow warbler (moderate +), chukar (low +), and California quail (low +). Based on pre- and post-construction aerial photographs, riparian vegetation seems to be increasing on islands and along the banks of the lower Clearwater.

After impacts were presented, the Nez Perce Tribe presented some tentative target species mitigation goals which they had developed. Work group members questioned whether enough information existed to make qualitative judgments of impacts, and whether mitigation goals should have been developed without work group input. The (moderate -) impact determined for breeding Canada geese was questioned. The estimated impact on breeding bald eagles (high -) was also questioned. The Nez Perce Tribe provided rationale for these estimated impacts.

Nez Perce Tribe Presentation on Mitigation Planning

The Nez Perce Tribe mentioned that the two reports had turned up a lot of good information, and that more discussion was needed on the Nez Perce report. They had been asked by BPA to set some initial targets or goals. No area was tied to goals. It was reiterated that both reports had been directed to use existing information. It was felt that the role of the work group was to sit down and firm up "rationale of impacts." All are concerned about the resource around the Dworshak Project area.

The Nez Perce Tribe gave a brief background on Section 1000 of the Columbia Basin Fish and Wildlife Program. They felt we were somewhere near the end of the wildlife loss assessment, and start of the mitigation plan. It was felt that the portion of Section 1000 pertaining to mitigation agreements left a lot of leeway for the agencies. The Nez Perce Tribe felt that if agreements could be reached, then longer stages of planning could be bypassed. They pointed out that Montana had mitigation plans for Libby and Hungry Horse amended into the program after the negotiation process.

IDFG Presentation on Mitigation Planning

IDFG began the presentation with an examination of the "negotiated settlement" or "agreement" type of approach to Phase II mitigation planning. The Northwest Power Act directs BPA 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..." The Act also directs that information

that is amended into the Program be based on the best available scientific knowledge. Without additional information which could be provided by HEP, IDFG wondered how firm of ground we could stand on during negotiations when impacts haven't been qualified or agreed upon. Mitigation accomplished through the negotiations must be agreed upon by all parties, of which PNUCC (Pacific Northwest Utilities Conference Committee) would be one. PNUCC has stated in an earlier meeting that we should not mitigate for anything except elk at Dworshak. It was pointed out that Dworshak has 30 years of mitigation negotiations behind it now. It was pointed out that a difference between "negotiated settlements" and "mitigation planning" is that BPA will fund mitigation planning, whereas a lot of non-funded background work would need to be conducted before negotiations would be possible. IDFG showed the work groups copies of wildlife mitigation plans which had been prepared for both Libby and Hungry Horse hydroelectric projects in Montana.

IDFG proposed to prepare a wildlife mitigation plan during Phase II. They suggested that a HEP should be conducted on target species to produce standardized units of measure for the impacts. A slide presentation was given on the basic mechanics of HEP.

Discussion on Direction of Mitigation Planning

Much of the discussion centered around the use of HEP during Phase II mitigation planning. IDFG suggested that the field portion of a HEP on Dworshak could be conducted in four weeks. USACE felt that conducting a HEP in a multicover situation such as Dworshak was very time consuming, and would take longer than four weeks. In particular, concerns were mentioned about using HEP on a multicover target species, such as white-tailed deer. After other discussion, it was generally agreed that a HEP could take varying degrees of time, based on the detail which would be accepted by the work group, Bonneville Power, and the Northwest Power Council. USFWS suggested that a HEP course could be given in the Lewiston area.

USACE pointed out that they were not comfortable with only reviewing the draft report once, and then not knowing if their comments were incorporated into the final report. BPA explained that the current contracts only called for one review period. IDFG mentioned that they had copies of all agencies comments on the draft report, and the IDFG replies to the comments, available to hand out to anyone interested.

Discussions were held on whether the Phase II wildlife mitigation plan should consist of two separate reports, similar to the Phase I loss assessment, or if it should be a single report, with one lead agency. No conclusions were drawn at the meeting.

At the end of the meeting, BPA requested comments from each agency on the direction of future mitigation planning at Dworshak, and the role of involved parties. The meeting adjourned at 4:30 p.m.

R4GM21SA

JUNE 11, 1855

Nez Perce

FOREST RESOURCE DEPARTMENT

Box 365
LAPWAI, IDAHO
83540

(208) 843-2253

Summary of Meeting

Interagency Work Group Meeting

October 15, 1987

Lapwai, Idaho

Afternoon Session

The afternoon session of the meeting concentrated on Bald Eagle and Osprey mitigation over the entire study area, Dworshak Reservoir and along the Lower Clearwater from Dworshak Dam to Lewiston.

A discussion of Osprey started the afternoon session. It was acknowledged that there was a significant amount of work done on Osprey in general, but little was known about this specific population. The COE informally keeps track of nest locations but has no on-going program concerning Osprey. It was agreed to that the formation of the Reservoir was generally, beneficial to Osprey nesting and that Osprey populations were expanding overall, but the question of why there were no nests down stream from the dam site was still unanswerable. Several theories were presented. The exposure of the nestlings to summer heat along the Clearwater (Don

Johnson, personal Com.) was mentioned a possible reason, however, it was pointed out that Osprey arc known to nest in areas of greater heat intensity than what is seen in the Clearwater valley. The number of suitable nesting sites and the amount of river fluctuations during the nesting season may be the critical elements in nest site selection along the lower Clearwater. This question has never been addressed for this population. The resource status at this time is not known. The relative stability of the Osprey populations in the region and funding cutbacks of land managers in the region has lead to a reduction in population monitoring by all government agencies at this time.

Discussion on the Bald Eagle population in this area was concerned with the wintering population. Here again the lack of specific information on the wintering populations was noted. A discussion on the ecology of wintering Bald Eagles in this location was covered with possible ramifications due to hydro-power generation on the wintering population. Is the population of wintering Bald Eagles an indication of an expanding population or is it a concentration of Eagles due to an added winter feeding site provided by flushing fish through the turbines at Dworshak? What are the management policies concerning this population of wintering Bald Eagles. At this time COE keeps access to the east side of the river from the dam to the confluence closed while Eagles are using the area.

The session that was scheduled for the morning of October 16, 1987 was combined with the afternoon session of October 15, 1987. The areas of concern covered in the late after session was the mitigation for habitat loss along the lower Clearwater from Dworshak to Lewiston. Targets species of concern were White Tail and Mule Deer, River Otter, Beaver, Quail, Chuker, Great Blue Heron, Canada Goose, Mallard and Yellow Warbler. These target species were chosen because the work group felt. They are highly visible and they represent the habitats that would be most impacted by down stream effect of Dworshak Dam. Documentation on these target species is scarce for the lower Clearwater River.

The riparian zone and adjacent lands along the lower Clear-water provided habitat for a resident population of white tails and muledeer (Asherin and Orme, 1978), but would be recognized as critical only under the most seven winter conditions. To date, there is little or no information for the deer populations along the lower Clearwater other than the inventory work by Asherin and Orme (1978). Their inventory showned very little use of the riparian zone along the river.

Geese, mallards, and Great Blue Herons were recognized as persistent residents along the lower Clearwater, tied closely to the islands and narrow shrub-brush riparian zone along the river. Their populations are not considered significant but

persistent. No pre-Dworshak documentation has been found concerning these target species.

Aquatic furbearers like the Beaver and River Otter are both tied directly to the quality of the riparian habitat. Beaver, though present along the lower Clearwater in moderate numbers have the dubious honor of being in conflict with human activities so they are trapped under a State of Idaho general permit and removed if there are any conflicts. Trapping records and personal communication with area trappers provide most of the historical information available.

The River Otter is present along the lower Clearwater but little is known of this population. They are protected but with their population being highly mobile and elusive the extent of the information on River Otter is limited to the inventory work of Asherine and Orme (1978).

Upland game birds were also located within the study area but once again information is lacking. Direct effects on the upland game populations by power generation on the lower Clearwater was considered marginal. Effects may be limited to vegetation changes due to stabilizing the maximum flows of the lower Clearwater.

It was pointed out that the effects along the lower Clearwater are not due to habitat lost to inundation but due to

changes in water chemistry, water temperature and changes in the cover type of the riparian zone and the islands. Subtle changes such as these may be more far reaching when considering the entire Columbia River, Snake River, Clearwater River ecosystem.

Methods of quantifying the loss were discussed. With little or no estimates of historical populations along the lower Clearwater, the difficulty in measuring loss, centers around measuring change in habitat vs. measuring a total loss of habitat due to inundation. If there is a reduction in the quality of habitat for one species but a gain for another how do we weigh the importance of one species against the other? Do we focus on a change in yellow marbler habitat vs. Canada Goose habitat or do we focus on the changes overall within a riparian zone along approximately 40 miles of the lower Clearwater River. HEP was brought up as a method to consider. The question also came up, do we need to follow the same approach above and below the dam and if so, do we follow the same approach for all species or just the target species that are found in both areas? COE felt that if HEP is used it should be done at a minimum on all target species common to above and below the reservoir.

The meeting closed at 6:15 p.m. October 15. No further work group meetings were scheduled at this time.

Minutes
of
Dworshak Reservoir Wildlife Protection,
Mitigation and Enhancement Planning
Consultation/Coordination Meeting

October 15, 1987
Lapwai, Idaho

The following people attended:

Dan Davis	U.S. Forest Service	208-476-4541
Jerome Hansen	Idaho Department of Fish and Game	208-334-5057
Loren Kroneman	Nez Perce Tribe	208-843-2253
Keith Lawrence	Nez Perce Tribe	208-843-2253
Vicki Saab Marks	U.S. Fish and Wildlife Service	208-334-1931
Ted Meske	Idaho Department of Fish and Game	208-743-6502
Allyn Meuleman	Idaho Department of Fish and Game	208-334-5057
Dick Moore	U.S. Army Corps of Engineers	208-476-7570

The major objective of the meeting was to review existing information pertaining to the impacts of Dworshak Dam and Reservoir on target species, and decide if additional information was needed to accurately assess impacts. After information for each target species was reviewed and exchanged by the interagency work group, methods for obtaining any necessary additional information were discussed.

The morning session dealt primarily with Dworshak Reservoir impacts to target species above the dam (excluding bald eagles and osprey) while the afternoon session centered on Dworshak impacts on bald eagles and osprey both above and below the dam and also impacts on other downstream target species. A review of the results of the meeting follows.

Above dam impacts - IDFG Project No. 87-111.

1. Habitat data. Some pre-project habitat and vegetation data is available from Heezen's (1961) work in the pool area. Thirty species of woody plants were encountered in the study. A total of 6,720 woody plants on 154 transects were measured. Information gathered included species composition, density, and big game utilization. The USFWS Coordination Act Report (1962) recorded principal cover types inundated by Dworshak Reservoir. Asherin and Orme (1978) sampled vegetation on 30 sites around Dworshak Reservoir. Vegetation attributes measured in the field included (1) species presence, (2) plant and ground coverage, (3) density, (4) frequency of occurrence, and (5) shrub and tree crown heights.

2. Elk. The work group agreed that because Dworshak impacts on elk have been intensively studied in the past, and because agreements have been reached on acceptable browse production goals to support 915 elk for 100 days in the winter, there would be no attempt to re-evaluate the impacts to elk. Rather, the amount of browse

currently produced on mitigation lands will be compared to mitigation goals. Based on preliminary information available at the meeting, it appears current browse production is far short of mitigation goals. Elk mitigation goals, alternatives, and solutions will be addressed during the mitigation planning phase of this contract. The work group agreed that impacts of past elk mitigation activities to other target species should be recorded.

3. White-tailed deer. Available information on the impacts of Dworshak Reservoir on white-tailed deer was presented and discussed. Pre-Dworshak data includes an aerial count of deer observed in the pool area during the 1954-1957 Clearwater Game and Range Study (IDFG 1957). Ninety-eight percent of the observed wintering population was counted in the area that would be inundated. The 1957 report concluded that numbers counted represented only a small proportion of the deer populations in the area. It was pointed out in the meeting that white-tailed deer are hard to accurately count in dense cover conditions. In 1975, it was estimated that white-tailed deer losses were approximately 40% of the pre-project population. The work group agreed that Dworshak Reservoir had inundated key white-tailed deer winter range and that no mitigation had been accomplished yet for white-tailed deer losses.

4. Black bear. The USFWS (1962) report stated that it was unlikely that black bears would suffer any great reduction in numbers due to the project. The Asherin and Orme (1978) study indicated that bears were still common around the reservoir. With the inundation of over 15,000 acres of habitat, the work group agreed that Dworshak has impacted the black bear. It was pointed out during the meeting that some of the lower, south facing slopes had probably provided important spring green-up foraging areas for bears. The work group agreed that in a lot of instances, elk and/or deer mitigation activities would probably benefit black bear.

5. Ruffed grouse. The USFWS (1962) report pointed out that populations of ruffed grouse in the vicinity of the reservoir would be greatly reduced. The Sport Fishing Institute (1981) concluded that significant losses of ruffed grouse were expected, but the losses in terms of habitat or populations were never identified. Asherin and Orme (1978) surveyed ruffed grouse in

coniferous vegetation types around Dworshak Reservoir, finding densities generally from 0.27 to 0.5 birds per hectare. The work group discussed possible benefits of past elk mitigation activities to ruffed grouse. It was felt that where abundant fruit-producing shrubfields (i.e. serviceberry, hawthorn, etc.) were created, then benefits may have occurred. Large shrubfields producing a minimum of preferred grouse foods were expected to only receive use around the edges.

6. River otter and beaver (aquatic furbearers). The USFWS (1962) concluded that fur animals, including river otter and beaver, would be adversely affected by the impoundment. Asherin and Orme (1978) observed both beaver and river otter using the exposed mud banks. No beaver production on the reservoir was noted during the study, while sightings of young river otter indicated that some reproduction is occurring. Asherin and Orme (1978) recommended separate studies on the impact of the reservoir on both river otter and mink.

7. Mallard and Canada goose (waterfowl). The USFWS (1962) report concluded that the North Fork of the Clearwater River is not located on a major waterfowl flyway, and that past project conditions in the area contributed little to this group. It also stated that limited waterfowl use occurs along some stream sections and both mallards and Canada geese have been observed in the area. The USFWS also concluded that if the project were built, extensive reservoir fluctuations would prevent establishment of waterfowl food plants and that waterfowl use of the reservoir would be chiefly for resting. Asherin and Orme (1978) agreed that waterfowl generally use the reservoir as a resting stop during spring and fall migrations, foraging on exposed mud banks. They also concluded that waterfowl nesting along the reservoir is minor. Inundation of nests on mud banks was expected to occur each spring as the pool was filled. The work group generally agreed with the conclusions in these reports. It was noted that a few Canada geese were known to nest on the North Fork of the Clearwater above the confluence with the Little North Fork, in the pre-Dworshak times. It was also noted that at least three mallard broods were observed on Dworshak Reservoir last spring, primarily associated with tributaries.

8. Pileated woodpecker (old growth). No information was presented on pileated woodpeckers, as none was found. It was felt that the pileated woodpecker had probably occurred in most forested areas of the pool area before inundation. It was mentioned that Panhandle National Forest personnel had worked extensively on old growth management practices and habitat requirements of old growth dependent wildlife species.

9. Yellow warbler. No information on this species was presented as none was found. It is used as a target species to represent the scrub-shrub wetland component which existed in riparian zones along the North Fork Clearwater River, prior to impoundment. The work group discussed pre-Dworshak riparian conditions. It was noted that a scrub-shrub wetland component did exist in a non-continuous manner in riparian areas all along the North Fork Clearwater River.

10. Data needed to supplement existing information. The work group agreed that although a large amount of wildlife information exists pertaining to Dworshak Reservoir, it does not adequately cover impacts to target species other than the elk. It was agreed that existing information would have to be supplemented with field data collected during a modified Habitat Evaluation Procedure (HEP) for each target species other than elk. The existing habitat information is more quantitative than qualitative. It was felt that collection of some qualitative field data was imperative in order to accurately assess the wildlife impacts from Dworshak Reservoir. The work group decided that we would gather the additional information needed under Phase II of the Dworshak Wildlife Protection, Mitigation and Enhancement Plan. Phase I of the Dworshak Plan will consist of existing information available as outlined in the objectives and will be completed February, 1988.

Minutes
of
Dworshak Wildlife Impact Assessment
Consultation/Coordination Meeting

July 9, 1987
Lewiston, Idaho

The following people attended:

Dick Giger	USFWS	503-231-6179
Jerome Hansen	IDFG	208-334-5057
Dean Johnson	IDL	208-245-4551
Jim Kosciuk	COE	208-476-7631
Loren A. Kroneman	Nez Perce Tribe	208-843-2253
Keith Lawrence	Nez Perce Tribe	208-843-2253
Vicki Saab Marks	USFWS	208-334-1931
John McKern	COE	509-522-6499
Sam McNeill	IDFG	208-743-6502
Ted Meske	IDFG	208-743-6502
Allyn Meuleman	IDFG	208-334-5057
Jim Meyer	BPA	503-234-5239
Dick Moore	COE	208-476-7570

The interagency work group discussed a number of topics related to wildlife mitigation planning at Dworshak Reservoir. Work statements for both the Nez Perce tribe (impacts below the dam) and Idaho Fish and Game (impacts from dam and above) were reviewed. Consultation/coordination requirements of the work group were discussed. Target species were selected for both the Nez Perce and Idaho Fish and Game projects.

Specific activities and discussions at the meeting included:

1. The goal of the work group is to reach a consensus on all issues. However, if a consensus cannot be reached, the work group agreed that a majority vote would be used. Each agency will have an opportunity to formally comment on the draft impact assessment.

2. Target species selected for the Idaho Fish and Game project (impacts from dam and above) included elk, white-tailed deer, ruffed grouse, pileated woodpecker, beaver, otter, yellow warbler, mallard, Canada goose, and black bear.

3. Target species selected for the Nez Perce project (impacts below the dam) included bald eagle, osprey, white-tailed deer, mallard, Canada goose, chukar, pheasant, California quail, beaver, otter, great blue heron, yellow warbler, and sucker.

4. The work group agreed that a two day field trip to the Dworshak area will be beneficial. The list of previously selected target

species will be re-examined while in the field. Changes to the list can be made by the work group during this field trip.

5. There will be close coordination between the Nez Perce Tribe and the Idaho Fish and Game projects. As much as possible, project activities and meetings will be scheduled concurrently. Future interagency coordination meetings were scheduled for October 15, 1987 and January 25, 1988.

Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208-3621

FEB 16 1988

In reply refer to: PJSR

Mr. Keith Lawrence
Nez Perce Indian Tribe
Wildlife Program
P.O. Box 305
Lapwai, ID 83540

Dear Keith:

This letter is a follow-up to our phone conversation on February 3,1988. The following comments are primarily ones which we discussed.

Overall the report is too lengthy and the impacts to wildlife in the Dworshak area are not clearly defined. Information needs to be summarized in tables or appendices where possible. The report needs to be more concise and clear so the reader can get a general idea of the impacts, even if the entire report is not read in depth. The summary should not present new information and should include all major points for each species.

Objectives 2 and 3 have not been addressed in the report. The current status, management goals and plans for target species need to be addressed. Wildlife/wildlife habitat protection, mitigation, and enhancement goals need to be discussed. Exact animal numbers or acre values do not have to be presented, but general goals should be given.

The discussion of habitat changes on islands needs to be expanded. Include information such as percentage changes in cover (ex. 66% decrease of annually flooded islands, 112% increase semi-permanent, and 113% increase in permanent cover between 1960 and 1982). On page 48 you mention a shift in percentages, yet no values are given. You need to discuss how changes in habitat affect wildlife.

The following are more specific comments:

G-20

Abstract - The first line does not clearly express where you investigated bald eagles, osprey, and other wildlife.	Changed
Abstract - You have good data on the change in vegetative cover on islands, yet you do not mention it. You should include a short statement telling about habitat changes, both on islands and along the shoreline.	Changed
Abstract - Marty Montgomery and Jim Meyer were observers and are not members of the work group.	Changed
Page 1. Line one of the introduction states that this is a "summation of existing information." This is not meant to be just a literature summary, rather it is suppose to use existing information to develop impact assessments.	Changed
Page 1. This project is intended to fulfill the requirements for Measure 1003, not 1004.	Changed
Page 1. Stating that this report is a "partial completion of a joint study" is confusing. The word "partial" should not be used since it could be interpreted that there is more than the 2 reports. Also, the way it is worded sounds like the objectives were the same for the two contracts.	Changed
Page 14. Describe or list what the 3 categories were.	Changed
Page 15. On line 4 you describe "low flows" in April and May. Shouldn't this be high flows?	Changed
Page 17. As we discussed, this is an example of information which should be presented in a table.	Presenting the flood information as a Table without narrative to explain the circumstances of the flooding and its impact would somehow reduce the impact and changes that occurred after the construction of Dworshak had on the lower Clearwater River.

Page 22. You discuss delayed impacts and how they may not be evident for a number of years. Holden stated that effects may not appear for "several years." The dam has been operational for the past 15 years. It seems that trends should be observable now even if changes are still occurring. Changes in vegetative cover are an example of this.	The statement was "slowly appear". It also mentioned that these "impacts were poorly understood and have not been well documented," which means that even with dams that are much older then Dworshak these impacts don't stand out and wave a flag. There is much to understand about the consequences of altering natural ecosystem with a man-made one. Changes are there but we don't tend to look close enough to see them.
Page 23. You state that the impacts may occur many miles below the damsite, outsite of study boundaries. Your study area extends to the Snake River. Any impacts that are going to occur should be evident within the study boundaries.	Impacts that are not readily noticable could be occurring beyond the Idaho State border. We'll probably never know the total changes that can occur.
Page 34. A resident fish study is currently underway for Dworshak Reservoir and estimates of non-game populations will be determined.	This has been noted at another point in the texted.
Page 37. Presenting differences of flow rate changes by percentages is deceptive. September's flow rate is 89% higher, but that was caused by an increase of only 3.1 cfs. Other months had greater increases, which would have undoubtly affected wildlife more, but the percentages are less since the base pre-impoundment flow rate was at a higher level.	Noted
Page 45. This figure is a nice flow diagram, but it is more general than is needed. You should be more specific about how changes relate to Dworshak.	All the information that was available, specific to Dworshak is presented. Many of the impacts covered by the diagram, did not have site specific information available.
Page 46. Discussion on habitat changes should be expanded as mentioned earlier.	Noted
Page 48. What efects does the change in vegetation, as listed on the bottom of the page, have on wildlife.	It would probably make a difference depending on which plant species were affected.

Page 50. According to your discussion on the 7 year study, it appears that smallmouth bass are the only fish to be impacted negatively. Is this true?	False - This is the results of a 7 year study, ending 4 years post-impoundment. The small mouth bass was directly impacted due to lost habitat and changes in water temperature. How their same loss could have affected other non game species wasn't covered. What
Page 52. Population size information for both pre- and post-construction conditions should be presented in table format for ease of reading.	Noted
Page 55. It would be better to include a table of the Corps eagle survey results so the reader can see trends.	Noted
Page 59. You have information about nesting bald eagles mixed with information about wintering eagles in the first paragraph.	Changed
Page 59. Rationale for the conclusion that 2 or 3 bald eagle territories could be supported is not provided. Your conclusion does not follow the Bald Eagle Recovery Team's goal of 1 nesting pair.	Changed
Page 61. You have a reference to a personal communication, but do not provide the person's name.	Changed
Page 61. Melquist's data of 270 and 286 osprey nests in 1972 and 1973, respecitvely, needs to be refined to the number of nests in the Dworshak area. The information, as is currently presented, does not provide specific enough information for the area of concern.	Changed
Page 62. The information on the osprey nests is interesting, but including everything (particularily the last 4 sentences) adds to the bulk of the report. Important information may be lost to the reader.	Changed
Page 63. The nest information in the first paragraph should be displayed in table form.	Changed
Page 63. How does information about the Middle Fork relate to Dworshak impacts?	Changed
Page 64. The first sentence ("Corps lands provide...") in the first paragraph does not make sense.	Changed

Page 69. Last paragraph - "releaf"	Changed
Page 71. No name provided with the personal communication reference.	Changed
Page 71. What significance to this study is the information that Melquist found 41 otters in the Cascade Reservoir. Information needs to be more specifically related to the Dworshak area.	Changed
Page 72. No documentation is provided which shows that river otters' prey base has decreased.	Changed
Page 72. "fish species adverse diversity" - ?	Changed
Page 72. Were pools and sloughs common along the lower Clearwater R.?	No they were not common that's why the ones that were there were important.
Page 75. Information describing the exact location of dens is an example of extra information which could be cut to shorten the report.	Changed
Page 78. Why cite a general reference such as Bellrose? A reference more specific to the region would be more valuable.	Noted
Page 78. The use of an area for wintering waterfowl is not only dependent on the amount of open water, but also on food availability and harassment level.	Waterfowl will not winter in an area without open water.
Page 79. This data should be presented in a table.	Noted
Page 80. Information on habitat changes along the river banks should have been included in this discussion (similar to the island information.)	Noted
Page 80. How important was the floodplain area for nesting waterfowl? On page 84 you state that the lower Clearwater floodplain is narrow and that low-lying and slough areas would not be in abundance.	Changed
Page 81. How critical were the gravel and sand bars for waterfowl loafing? It doesn't seem that they would be a limiting factor.	Changed
Page 83. The information on great blue heron's nests is not important since the area is outside their breeding range. This is an example of interesting, but not necessary information.	There were blue herons documented in most every month of the year. This area is obviously a fringe area for breeding but I believe there is some within the area. We didn't say that nesting occurred within the study area, We said it was used as a feeding area.

Page 86. General species information, such as the first 4 sentences on this page, should not be included under the category "Pre-construction conditions".

Noted

Page 89. Same comment as above.

Noted

Page 89. "river fish" - ?

Changed

Page 92. Bald Eagle - First sentence eludes to idea that a number of acres of valuable nesting habitat was lost. Since the Bald Eagle Recovery Team determined that the area could support 1 pair of nesting eagles, the habitat is obviously of poor quality.

Bald Eagle Recovery Team set a goal of 1 at this time. It did not say it could support only 1. But you may be right with the loss of fishery productivity in the N.F. because of Dworshak we may never get bald eagles in there again.

Page 94. On page 76, a statement is made that the beaver population is expanding. This should be included in the summary.

There was a difference between the area included in their study as opposed to the one in this report. We feel their data and assumption didn't suppose their claim of an expanding population.

Page 94. Information from the text saying that wintering populations of waterfowl should increase due to availability of free flowing water should be included in the summary.

The report said opportunities will increase not populations.

If you have any questions about my comments, feel free to call me.

Sincerely,

Mary

Mary Maheffy
Wildlife Biologist

600 South Walnut • Box 25
Boise, Idaho 83707

February 24, 1988

Larry D. Marek, Chairman
Nez Perce Forest Resource Department
P.O. Box 365
Lapwai, ID 83540

Dear Mr. Marek:

We have reviewed your Draft Report for Phase I of Project No. 87-406: Wildlife Protection, Mitigation, and Enhancement Planning for Dworshak Dam. The Draft Report documents existing information regarding project effects on wildlife downstream from Dworshak Dam, and effects on bald eagles and ospreys above and below the dam.

We feel there is not enough existing information to quantify Dworshak Project impacts on wildlife. A Habitat Evaluation Procedure (HEP) needs to be applied to the Dworshak impact area. This would allow the interagency team of biologists to assess habitat quality and quantity changes in standardized, manageable units of measure that can be carried through the accounting of mitigation benefits.

G-28

Thank you for the opportunity to comment on the report. We look forward to further coordination during this planning process.

Sincerely,

Jerry M. Conley
Director

JMC/GAW/ss

IDAHO FISH & GAME

600 South Walnut • Box 25
Boise, Idaho 83707

March 25, 1988

Keith Lawrence
Nez Perce Tribe
Wildlife Program
P.O. Box 305
Lapwai, ID 83540

Dear Keith:

We have reviewed the Phase I Dworshak Wildlife Loss Assessment (Project #87-406), prepared by the Nez Perce Tribe. This report examines the impacts of the construction and operation of Dworshak Dam on bald eagles and osprey, and on wildlife populations and habitats downstream from the dam site on the lower Clearwater River. We compliment the authors as it is evident that a lot of hard work has gone into this very complex subject. We offer you the following general and specific comments in addition to our earlier letter. If there are any questions, feel free to call us at (208)334-3057.

General

1. The report needs to be carefully edited, as several punctuation, spelling, and sentence structure problems make portions of the report hard to understand.

2. In general terms, it seems that pages 15 through 51 of the Results and Discussion section could be condensed, so that the reader is better able to understand the main points of the relationship of water chemistry and flow changes to wildlife impacts.

3. The statement "increased stability of the lower Clearwater will increase man's activities along the river" is used several times during target species discussions. Has there been a large increase in activities in the 15+ years since the gates on Dworshak Dam were closed?

4. Throughout the report, a lot of potential impacts to target species (both positive and negative) are suggested, with few conclusions being drawn. It appears that there was not enough existing information to adequately quantify and qualify wildlife impacts from the Dworshak Project. Use of the Habitat Evaluation Procedure (HEP) would allow the interagency team of biologists to assess

habitat quality and quantity changes in standardized measurement units that can be carried through the accounting of mitigation benefits.

Specific

Page 2	Please mention that we coordinated with the Pacific Northwest Utilities Conference Committee throughout this planning process.	NOTED
Page 11	Should wildlife impacts directly facilitated by construction of the Dworshak Project should be described as "secondary?"	NOTED
Page 12	Selection of 12 target species is mentioned, while Table 1 on page 13 only shows 11 target species.	CHANGED
Page 15	"Low" flows during April through May should be changed to "high" flows.	CHANGED
Page 18	Should delete initials K.W. from citation, K.W. Cummins (1979). Other citations where initials are used should also be changed.	CHANGED
Page 19	Is "maintained in a state of immaturity by the practice of agriculture" related to Dworshak impacts on wildlife?	NOTED
Page 26	How are some of these actions (i.e. surface currents and seismic activity) related to wildlife impacts from the Dworshak Project?	This documentation is presented to better clarify potential impacts to wildlife even though we admit there may not be direct impacts from these occurrences at this time.
Page 44	It is our understanding that scrub-shrub and deciduous forested wetlands are increasing along the lower Clearwater River. If so, the last paragraph does not seem to clearly explain the increase of these valuable habitats.	The report did document a change from annually flooded cover types to semi-permanent, "scrub-shrub," and permanent," deciduous forested," cover types. The report does not show an overall increase in riparian habitats. This result is also limited to relatively undisturbed islands and not many streamside areas.
Page 45	This figure contains undefined terms (i.e. unbroken diapause), which make it hard to understand.	NOTED
Page 47	Please define the individual cover types outlined in Figure 10. In relative terms, it does not appear that the actual acreage of islands has changed much from 1960 to 1982.	NOTED
Page 50	Not clear if the drop in small mouth bass harvest was tied more to the operation of Dworshak Reservoir, or to the removal of the Washington Water Power Dam. What year was the Washington Water Power Dam destroyed?	NOTED

Page 52	In what portion of the Little North Fork was the bald eagle nest from 1930 and 1931 located?	Upper end of the pool area.
Page 52	It might be helpful to separate the discussion into wintering and breeding impact subsections.	NOTED
Page 54	It might be helpful to illustrate river mile locations and islands mentioned in the text.	NOTED
Page 55	Use of the term "mitigating circumstances" is somewhat confusing, given the purpose of the Phase I planning process.	NOTED
Page 56	We question whether the construction of Dworshak Reservoir "should have enhanced the study area for breeding bald eagles because of their affinity for large, open expanses of water." The Greater Yellowstone Ecosystem Bald Eagle Working Group (1983) outlines the following five aquatic habitat situations which are important in providing available prey for breeding bald eagles. 1. Tributaries with conditions suitable for salmonid spawning during April-June and suitable conditions for early salmonid movement in March; 2. Shallow, gravel areas in major rivers that are suitable for salmonid feeding and spawning; 3. Pools or conditions that promote surface feeding by salmonids; 4. Shallow areas with conditions suitable for feeding and spawning of benthic oriented species (i.e., Utah sucker); and 5. Wetlands suitable for waterfowl feeding and loafing.	NOTED
Page 56	It is our understanding that the area covered by the goal of establishing one nesting pair of bald eagles includes the Clearwater River.	CHANGED
Page 56	Why were breeding bald eagle impacts restricted to the area above Dent Bridge?	The area above Dent bridge was where long-term residents remember seeing nesting bald eagles. No documentation was available for below Dent bridge.
Page 56	We agree that human disturbance can be detrimental to breeding bald eagles. However, the loss of 25,900 acres of historical and potential bald eagle nesting habitat implies that bald eagles will never be expected to nest above Dent Bridge. It seems that stating that the acreage above high water line has	NOTED

been negatively impacted may be more appropriate. Impacts would also seem to be tied to the loss of shallow water feeding areas, previously provided by the river under pre-construction conditions.

Page 57 The rationale used for the conclusion at the end of the first paragraph, "long term stability of a prey base under these conditions is doubtful" is unclear.

NOTED

Page 59 The first sentence doesn't seem consistent with previous statements.

NOTED

Page 59 We disagree that the open drawdown area and frozen over reservoir are ideal for feeding areas. The food source made available to bald eagles because of these conditions is unreliable at best.

NOTED

Page 59 The conclusion that "a minimum of one and realistically two or three bald eagle nesting territories could be supported above Dent Bridge" does not seem consistent with statements on pages 56 and 57.

CHANGED

Page 59 Concluding paragraph seems inconsistent with previous statements. Also, does it refer to breeding or wintering bald eagles, or both?

Conclusion refers to bald eagle impact on both winter and summer range.

Page 64 Based on known osprey nesting locations around human developments in northern Idaho, there seems to be some question on the degree of impact that human disturbance has on osprey.

NOTED

Page 66 White-tailed deer winter range delineated by Norberg and Trout (1958) also contained habitat components important to wintering whitetails. It is not clear from this report if these components existed on the lower Clearwater.

NOTED

Page 69 The loss of extensive white-tailed deer winter range at Dworshak Reservoir does not mean that "more animals are now being confined into a small winter range area." This statement contradicts the concepts of habitat potential and carrying capacity. This implies that there were not white-tailed deer losses from Dworshak Reservoir.

NOTED

Page 69 We have not seen the term "overflow relief" used before.

NOTED

Page 69 Have there been documented deer drownings along the lower Clearwater River?

No documentation available.

Page 72 We are not sure if "isolated," "temporary," or "inconvenient" are good descripters of impacts to river otter.

NOTED

Page 73 No real conclusions seem to be drawn on downstream impacts to river otter. Is additional information needed on this and other target species impacts?

NOTED

Page 77 When is the width of the riparian habitat expected to decrease? We understand that at this point in time, riparian vegetation is actually increasing.

No measurement on the change in width of streamside riparian habitat was made. Riparian habitat is changing to different seral stages but is not increasing overall and probably is in fact decreasing.

Page 80 It would seem that island stabilization and the increase in riparian vegetation would increase the value of the lower Clearwater to nesting waterfowl. The first paragraph of the impact assessment implies a reduction in carrying capacity for nesting waterfowl.

A change from an annually flooded area, i.e. gravel bar, to a low shrub cover type would benefit canada goose and mallard nesting. But the data indicates the low shrub cover type will be invaded by black cottonwood or ponderosa pine which will eventually reduce the benefit to nesting waterfowl.

Page 80 Could reduced flows during nesting and brooding season expose additional islands?

NOTED

Page 81 Is there a lack of loafing areas along the lower Clearwater?

No data is available on the quantity and use of loafing areas along the lower Clearwater River.

Page 85 It would not seem that Great Blue herons could have an impact on prey species on a river system the size of the Clearwater. Assuming that they are very opportunistic feeders, it would not seem that they would have a preferred prey species.

NOTED

Page 88 In the first paragraph of the impact assessment, the term "may be detrimental" should be changed to "may reduce benefits." Also, we don't feel that yellow warblers are impacted by harassment.

NOTED

Appendix B. It might be noted that land use classifications and acreages will change in the final master plan.

NOTED

Thank you for the opportunity to comment on the Phase I, Dworshak Wildlife Impact Assessment. It is evident that a lot of hard work has gone into this very complex subject. We have enjoyed coordinating with the Nez Perce Tribe and look forward to continued consultation and coordination during Phase II, Dworshak Wildlife Mitigation Planning.

Sincerely,

G. Allyn Meuleman
Regional Wildlife Biologist

GAM/HJH/sa

United States Department of Agriculture | Forest Service | Clearwater National Forest | 12730 Highway 12 Orofino, ID 83544

Caring for the Land and Serving People

Reply to: 2610

Date: February 1, 1988

Larry D. Marek
Chairman, Fish and Wildlife Subcommittee
Nez Perce Forest Resource Department
Lapwai, ID 83540

Dear Larry:

Thank you for the opportunity to review the draft report for Phase 1 of the Wildlife Protection, Mitigation and Enhancement Planning for Dworshak Dam.

We found no major problems or concerns with the document. We fully support the efforts of all agencies and interested parties in the development of a Comprehensive Protection, Mitigation and Enhancement Plan for Dworshak Dam. This Phase 1 report was well written and very thorough. The authors did an excellent job of documenting historical wildlife information.

Thanks again and please continue to keep us a part of the process.

Sincerely,

for Charles W. Mowen
FREDERICK L. TREVEY
Forest Supervisor

G-32

STATE OF IDAHO

DEPARTMENT OF LANDS

St. Joe Area Office (208) 245-4551
1806 Main Avenue, St. Maries, Idaho 83861

February 23, 1988

Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208

ATTN: Ms. Mary S. Mahaffy, Wildlife Biologist

RE: FJSR, Dworshak Wildlife Protection, Mitigation and Enhancement Plan, Phase I

Dear Ms. Mahaffy:

This will address the Idaho Department of Fish and Game (IDFG) and the Nez Perce Indian Tribe (Tribe) Reports on this matter, and the meeting held in Lewiston on February 18, 1988.

Comments were previously sent to the IDFG, and a copy of that package is attached for your information.

The Tribe Report and the meeting generate further comment:

1. As is well brought out in the Tribe Report, the effects of the project on the Clearwater River downstream from the confluence with the North Fork are great. Altered river temperatures, flow rates, chemistry, etc. combine to create an unnatural condition. A secondary impact is the altered vegetative succession. As described at the meeting, the Tribe Report represents a "snapshot in time," i.e., there is every likelihood that further changes are yet to come, and we can't be exactly certain what they will be. Therefore, as the parties proceed with mitigation efforts it will be prudent to be flexible and to keep contingency planning in mind.

2. It became very obvious at the meeting that habitat information is more or less lacking for many of the target species. While there appeared to be consensus that the Habitat Evaluation Procedure (HEP) would be the best approach to provide the necessary information in order to make wise decisions for mitigation steps, there is concern that HEP could become a very lengthy process. Keeping in mind that the reservoir has been in place some 15 years, during which little mitigation activity has taken place, it is highly desirable that further delays be minimized. If a few steps can be sensibly taken in the interim while HEP is in progress, they should be accomplished.

3. In the overview, through a social decision the dam and reservoir are facts of life. Some components of the former ecosystem may be irretrievably lost. Others have been altered to a greater or lesser extent. In some instances this change is generally considered to be bad, but in others it may be considered good. Whichever, it is impractical to expect that all that was good about the former river can now be restored, that it is possible to have the best of both worlds - the river and the reservoir. Tradeoffs must be accepted.

4. A point to ponder is what would have happened had the dam and reservoir project not taken place? There is little question about the answer, for better or worse. The land with few exceptions would have remained in state and private ownership under commercial forest management. In due time, as we can clearly see now, road systems would be extended and logging techniques would be developed to harvest the commercial timber on all but the most rugged terrain adjacent to the river. Even-aged forest management for which the local coniferous species are best suited would have removed the timber by either the clearcut/burn/plan or seed tree/natural regeneration/overstory removal scenarios. The end result is much the same in either case, with an absence for a period of time of mature timber on the site, except for the required 75 foot wide stream protection zone on each side of the river.

   In contrast, the reports make reference to the Dworshak Project having disrupted the pristine conditions, thus mandating mitigation measures. In reality as far as pristine conditions go, there was no question that they would be altered, rather it was a matter of which changes - the Dworshak Project or commercial forest management. A significant difference between the two is that in the latter case there would have been no federally funded mitigation program.

Both reports do a commendable job of initiating the mitigation process. Of course there are some differing interpretations and also uncertainties where information is inadequate. But a good start has been made, and there is optimism that Phase II will result in clear directions as to what mitigation measures are needed.

Sincerely,

Dean W. Johnson

Dean W. Johnson,
Area Supervisor

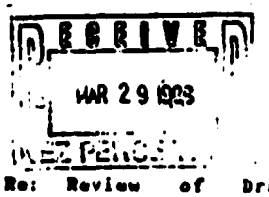
DWJ:pm
pc: ID Dept. of Fish & Game, Jerome Hanson
Nez Perce Indian Tribe, Loren Kronemann

United States Department of the Interior

FISH AND WILDLIFE SERVICE
BOISE FIELD OFFICE
4696 Overland Road, Room 576
Boise, Idaho 83705

March 25, 1988

Mr. Keith Lawrence
Nez Perce Indian Tribe
Forest Resource Department
Box 365
Lapwai, Idaho 83540



Re: Review of Draft Dworshak Wildlife Protection, Mitigation, and Enhancement Plan, Phase I

Dear Keith:

The U.S. Fish and Wildlife Service (Service) has reviewed the referenced draft report, and we have the following general and specific comments.

General Comments

G-35

A table is needed to describe acreage losses due to the various project operations (e.g., losses due to inundation, roads, dam construction, etc.). Habitat acreages should be determined for each target species for pre- and post-project conditions. Water level fluctuations need better illustration and explanation. What is meant by irregular fluctuations and how often do these occur (see p. 76, one paragraph states irregularity of releases, the next paragraph discusses stability of the Lower Clearwater River)? A better explanation of pre- and post-project water flows is needed.

It is recommended that you only refer to "authors" when you are speaking of yourselves, otherwise it is confusing. Do not use a person's initials when citing in the text unless it is a personal communication. Introduce the use of an acronym only the first time it is used.

Bald Eagle - Structural characteristics and productivity of a reservoir must be considered before assuming that an entire body of water is suitable foraging habitat (see Peterson 1986). Please explain how you calculated 25,900 acres of lost historical nesting habitat. We believe that some bald eagle nesting habitat still exists today. How did you derive 3 nesting territories? We agree that increased human activity could affect reintroduction efforts; however, most of the nesting period occurs prior to most human activity. Prey availability during historic times could have been unpredictable in some years due to drought conditions. Please include a table of winter bald eagle counts at Dworshak Reservoir.

Osprey - Do you consider all of the reservoir potential foraging habitat? Once again, we believe that structural characteristics and productivity of the reservoir must be considered before assuming that an entire reservoir is suitable foraging habitat. Based on the increase in numbers of nesting pairs since 1976, the reservoir appears to have benefited ospreys. We do not understand how you justify a high negative impact for the lower Clearwater River. This is not supported in your report. Do you have other evidence that ospreys nested along the lower Clearwater River prior to dam construction?

White-tailed Deer - We would expect habitat gains for deer because of an increase in riparian areas. We would also expect an increase in overall deer habitat quality with an increase in riparian areas, i.e. forested and scrub-shrub wetlands.

River Otter - Do you have any references on how prey availability changes with water temperature? We do not understand the impact assessment as it relates to water level fluctuations and island maintenance.

Beaver - There are inconsistent statements concerning riparian habitat. In some sections you state that flood control, as a result of dam construction, will increase riparian habitat. In other sections you state that the width of the riparian habitat will decrease (decrease from what?) and cause a negative impact on beavers. We are not certain if the summary impact assessment supports your statements from the February 18 meeting (low positive impact to beaver).

Canada Geese - Water level fluctuations that occurred pre-project (see Fig 6, p. 38) indicate that conditions have probably improved for geese because of reduced flooding peaks. There is no documentation that flows get low enough to form land bridges. A discussion on breeding-rearing habitat should be included.

Great Blue Heron - The summary in your report is not consistent with your February 18 meeting presentation. At the meeting you reported a low positive impact for herons; whereas, the report indicates a loss in feeding and nesting habitat. The discussion on impact assessment is unclear. When do reduced maximum flows occur and how do sloughs regenerate? How does seasonal recharging of the floodplain provide "unique islands of habitat"? When referring to a reduced riparian area, please provide acreage value.

Yellow Warbler - The impact assessment seems reasonable.

Chukar and California Quail - The statement on reductions in flooding and improved nesting success is inconsistent with your statement about geese and mallards; all of these birds are upland nesters.

Specific Comments

p. 18, paragraph 1 - Change "low flows..." to high flows in second paragraph. CHANGED

p. 19, paragraph 1 - Please provide citation for reference.	CHANGED
p. 19, paragraph 2 - We agree that flood flows are an important characteristic of riverine ecosystems. However, we disagree with the statement that these flows keep the riparian zone "...in a constant form of primary succession not allowing advancement to maturity..." Extensive areas of cottonwood gallery forests existed in the west where alluvial soils were deposited (floodplains). These would certainly be considered "climax" in the successional sense. Cottonwood regeneration is closely linked to flooding cycles (Johnson et al. 1976). Riparian zones along high gradient streams are narrow and exposed to more erosive forces. The classic gallery forests found in floodplain areas are not typically present because of water velocities and poor soil conditions. The last sentence in this paragraph is not clear. In addition we could not locate the quote in Baxter (1977). Please provide page number when using a direct quote from a reference.	NOTED
p. 20, paragraph 1 - Did you count the number of islands and their size? This information would be helpful.	Refer to Appendix C.3
p. 20, paragraph 2 - Space 1980 is not in the Literature Cited.	CHANGED
p. 27, item 5 - Earlier statement of water quality (p. 20) indicated that sediment load in North Fork drainage is low. Also in item 4 it was noted that the reservoir acts as a sediment trap. We would expect water quality (turbidity) improvements downstream of the dam rather than the degradation noted here. Water quality data from the U.S. Geological Survey, Idaho Department of Health and Welfare, or other sources would be helpful here to support your contention.	Turbidity would be lower downstream from the dam but would be present in the system for a longer period of time.
p. 28, item 6 - Additional limnological data and references would be helpful here. The University of Idaho (Falter 1976) and Idaho Department of Fish and Game (Ball and Pettit 1974, Pettit et al. 1975, Pettit 1976 and 1977) have conducted limnological studies in Dworshak Reservoir and downstream areas.	NOTED
p. 29, item 7 - Comparing temperature conditions between a lacustrine and riverine system is inappropriate here.	NOTED
p. 32, item 8 - Please provide reference for the last sentence. Is this statement true for the entire North Fork drainage or just Dworshak Reservoir?	Reference is Asherin and Orme (1978)
p. 32, item 9 - We suggest you use the word "impoundment" rather than "lacustrinization". References would be helpful in your discussions specific to Dworshak Reservoir.	NOTED
p. 40, paragraph 1 - Additional data on the frequency of power peaking would be helpful.	NOTED
p. 43, paragraph 3 - The Department has investigated fish populations below Dworshak Dam in relation to water quality	

(Ball and Pettit 1974, Pettit et al. 1975, Pettit 1976 and 1977). These data would be useful in evaluating water quality (including water temperature) effects on aquatic biota.	These Idaho Department of Fish and Game reports do not provide any water quality information. The reports may be just a portion of a larger study.
p. 44, paragraph 2 - Water temperature changes can have dramatic effects on aquatic biota. However, the references used here are confusing and may be misleading. Temperature tolerance limits for aquatic invertebrates and fish have been studied in detail (Environmental Protection Agency 1986). Some reservoirs cause dramatic temperature changes downstream. However, is a 1-3°C difference in the Lower Clearwater a significant change? It would be helpful if site specific temperature data were compared with tolerance limits for species of special concern to determine if there is reason for concern.	NOTED
p. 53, paragraph 3, sentence 2 - Please explain "undocumented" sighting. Did Black actually observe a nest or only a pair of bald eagles?	The sighting was not reported to USFW or IDFG. Only a pair of adult eagles were sighted.
p. 55, paragraph 3, sentence 1,2 - Explain what is meant by "mitigating circumstances". Based on the pre-construction conditions discussed in your document, breeding bald eagles were scare in the study area, and therefore construction of Dworshak Dam probably had little impact on nesting eagles.	NOTED
p. 56, paragraph 2, sentence 1 - The construction of a reservoir does not necessarily enhance the area for breeding bald eagles. Colder temperatures and less light penetration occur in relatively deep reservoirs (like Dworshak), creating a less productive system (in terms of foraging habitat) for bald eagles than a more shallow body of water (Detrich 1985 in Peterson 1986).	NOTED
p. 56, paragraph 2, sentence 2 - Change citation "Steenhof pers. commun." to U.S. Fish and Wildlife Service 1986.	NOTED
p. 56, paragraph 2, sentence 3 - Creation of the reservoir may have increased access, logging activities, and human disturbance; however, the habitat apparently was marginally suitable pre-project, and future without the project may not have been anymore suitable for nesting bald eagles.	NOTED
p. 57, paragraph 2 - The structure of the river pre-project and the reservoir is a key factor in determining prey availability for bald eagles. A deep, steep-sided reservoir might create conditions that make prey less available.	NOTED
p. 57, paragraph 3, sentence 6 - It is unclear why dead kokanee is an unstable food source for wintering bald eagles.	There are winters when kokanee are not killed in large amounts by passing through the dam's turbines.
p. 59, paragraph 1 - It is unclear how the prey base for wintering bald eagles affects the number of nesting bald eagles.	CHANGED
p. 59, paragraph 2, sentence 1 - Provide a citation to document this statement.	NOTED

p. 59, paragraph 2, sentence 2 - Provide documentation that fish were stranded during normal fluctuations.	NOTED
p. 59, paragraph 3 - Need to provide better documentation as to how Dworshak Reservoir could benefit bald eagles. It is unclear as written.	NOTED
p. 61, paragraph 1, sentence 2 - Identify the person for the pers. commun.	CHANGED
p. 63, paragraph 2, sentence 2 - This sentence is unclear. What is the relevance of "similar in cover type". Ospreys still do not nest in the lower reaches of the Clearwater River and there are many possible variables accounting for this. Even if the cover types are similar in the different reaches, the structure within these cover types might be different.	NOTED
p. 64, paragraph 1 - Ospreys are productive in areas with a fair amount of human disturbances (see Van Daele et al. 1980).	NOTED
p. 64, paragraph 3, sentence 1 - One should not assume that the entire reservoir is suitable for foraging. Suitability depends on the structural characteristics and productivity of the reservoir.	NOTED
p. 64, paragraph 3, sentence 3 - It would be useful to report on food habits and nesting studies conducted in Idaho.	NOTED
p. 64, paragraph 4, sentence 1 - This statement is unclear.	NOTED
p. 66, paragraph 1, sentence 2 - "...population of deer" should read these populations of deer since you are referring to 2 species of deer and they are separate populations.	CHANGED
p. 66, paragraph 3, sentence 4 - To be a complete sentence, "With elevation and exposure being ..." should be changed to - Elevation and exposure were factors...	CHANGED
p. 67, paragraph 2, sentence 3, paragraph 3, sentence 1 - Please report the dates of the deer observations and are you speaking of yourselves as the authors or Asherin and Orme (1978).	CHANGED
p. 69, paragraph 1, sentence 1 - Please clarify this statement with some documentation.	NOTED
p. 70, paragraph 2 - Please clarify the meaning of "isolated lakes" and "lack of seclusion".	NOTED
p. 71, paragraph 2, sentence 4 - A possible reason that tracks were only observed in sand banks may have been a function of detectability. Tracks would obviously be more detectable on a sandbar than in a vegetated area.	NOTED
p. 72, paragraph 1, sentence 6 - Please clarify this sentence. What is meant by "fish species adverse diversity"?	CHANGED

p. 72, paragraph 3 - Is there any documentation in the literature for this statement? Seasonally high flows can be detrimental to otters by flooding bank dens that are normally used for denning and resting sites (Melquist and Hornocker 1983). — CHANGED

p. 76, paragraph 2, sentence 3 - This sentence is unclear, please clarify. — CHANGED

p. 77, paragraph 2, sentence 1 - Riparian habitat will actually increase (see p. 72, paragraph 2) rather than "decrease" compared to pre-project conditions. From observations it appears that flood control has allowed for development of riparian vegetation downstream of the dam. This statement is contradictory to your discussion on p. 72 paragraph 2. — CHANGED

p. 80, paragraph 2 - Please document with literature. Unless the islands are completely choked with woody vegetation, they will continue to provide duck nesting habitat. — NOTED

p. 80, paragraph 6, p. 81, paragraph 1 - This paragraph is contradictory to previous discussions about habitat loss for nesting ducks and geese due to the increase in riparian vegetation. — CHANGED

p. 84, paragraph 2 - Please provide documentation for these statements. — NOTED

p. 92, paragraph 3 - No documentation is provided that there was 28,900 acres of bald eagle historical nesting habitat. Please provide rationale for this statement. — NOTED

p. 94, paragraph 1 - Are you speaking of historic floods and not current floods? — CHANGED

p. 94, paragraph 2 - Cover in riparian areas has increased due to project construction; so, we would assume that beavers would not be more vulnerable to predation. — NOTED

p. 95, paragraph 2 - Clarify this paragraph, it is unclear as written. — CHANGED

In conclusion, there are several inconsistencies and statements in the report that need clarification or additional documentation. We have already provided you with some literature (see attachment) that should be helpful in this effort. We would appreciate reviewing the report again after you have incorporated the recommended changes. Questions should be directed to Vicki Saab Marks or Signe Sather-Blair of this office, (208) 334-1931.

Sincerely,

John P. Wolflin
Field Supervisor

cc: IDFG, Hdqtrs., Boise
IDFG, Region 2, Lewiston
FWS, Portland FO, Portland (Attn: Giger)
COE, Walla Walla District, Walla Walla
COE, Portland District, Portland
NWPPC, Boise
BPA, Portland

Attachment

Literature Cited

Ball and Pettit 1974 *

Baxter, R.M. 1977. Environmental effects of dams and impoundments. Ann. Rev. Ecol. Syst. 8: 255-83.

Environmental Protection Agency. 1986. Quality criteria for water. EPA 440/5-86-001

Falter 1976 *

Johnson, W.C., R.L. Burgess, and W.R. Keammerrer. 1976. Forest overstory vegetation and environment on the Missouri River floodplain in North Dakota. Ecol. Monogr. 46:59-84.

Melquist, W.E. and M.G. Hornocker. 1983. Ecology of river otters in west central Idaho. Wildlife Monograph 83:1-60.

Petersen, A. 1986. Habitat suitability index models: Bald eagle (breeding season). U.S. Fish Wildl. Serv. Biol. Rep. 82 (10.126). 25 pp.

Pettit et al. 1975 *

Pettit 1976 *

Pettit 1977 *

U.S. Fish and Wildlife Service. 1986. Recovery plan for the Pacific Bald Eagle. U.S. Fish and Wildlife Service, Portland, Oregon.

Van Daele, L.J., H.A. Van Daele, and B.R. Johnson. 1980. The status and management of osprey in Long Valley, Idaho. University of Idaho.

* Copies loaned to the Nez Perce Tribe

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION, CORPS OF ENGINEERS
P.O. BOX 2870
PORTLAND, OREGON 97208-2870

March 1, 1988

REPLY TO ATTENTION OF

Environmental Resources Branch

Mr. Larry D. Marek, Chairman
Fish and Wildlife Committee
Nez Perce Indian Tribe
Forest Resource Department
Box 365
Lapwai, Idaho 83540

Dear Mr. Marek:

Enclosed for your consideration are the formal comments of the U.S. Army Corps of Engineers on the draft report for Phase I of the Dworshak Wildlife Protection, Mitigation, and Enhancement Plan which represents a complement to the report on the reservoir area prepared by Idaho Department of Fish and Game. The enclosure represents the consolidated comments of the respective staffs of the Walla Walla District office, the Dworshak project, and the North Pacific Division office.

If you have any questions, please feel free to call Mr. Owen Hansen of this office at (503) 221-3829.

Sincerely,

James R. Fry
Colonel, Corps of Engineers
Deputy Division Engineer

Enclosure

G-43

CENPD-PL-ER 29 February 1988

US ARMY CORPS OF ENGINEERS COMMENTS
ON THE DRAFT REPORT FOR PHASE I OF THE
DWORSHAK WILDLIFE PROTECTION, MITIGATION,
AND ENHANCEMENT PLAN

1. This report quite clearly displays the great lack of substantial data upon which to identify losses to wildlife or habitats along the lower Clearwater River caused by Dworshak Dam. Although a large volume of information is cited, little, if any serves to demonstrate any significant negative impacts to wildlife in the lower Clearwater River study area. As with the complementary Phase I draft report prepared by Idaho Department of Fish and Game, this report fails to substantiate or document either an injured or unhealthy animal population.

2. The text presented in this report does not particularly support the objectives (pages 1 and 2) established for the study. Specifically, the "...management goals, and plans..." for objective 2 on page 1 appear to be missing. Furthermore information to support objective 3 on page 2 does not seem to be presented per se.

3. The report needs considerable revamping regarding its organization and grammatical structure. Numerous spelling errors and incorrect scientific names and jargon were found in the report. Parts of the report are written in the past tense when describing losses or events which are presently occurring and will occur in the future. Other sections are written in a combination of present and past tense, confusing the reader as to whether the loss is still occurring. The present report should be viewed only as a "rough draft" from which a second draft can be produced. We believe that substantial reorganization and "polishing" should be done before an acceptable draft is ready for review.

4. Abstract, paragraph 2, line 13. Add the word "as" following the word "habitats." CHANGED

5. Abstract, last line. The correct spelling is "pristine." CHANGED

6. Page 9, line 7. Reference to North Fork should specify to what river. CHANGED

7. Page 10, line 12. Correct spelling to "less." CHANGED

8. Page 13, table 1. This table should include California Quail in order to be consistent with the report text. CHANGED

9. Page 15. Only some portions of the North Fork were pristine prior to construction of the dam. Page 20 states that the North Fork was impacted by the timber industry in the mid-1920s and 1930s. CHANGED

10. Page 15, line 5. This line refers to figure 3 which is the monthly flow for the Clearwater River, not the North Fork Clearwater River. This needs to be corrected.	CHANGED
11. Page 20, line 1. The word "sands" should be singular.	CHANGED
12. Page 23, line 4. Correct spelling is "stolorifera."	CHANGED
13. Page 34, line 11. This discussion should include Cutthroat Trout which are still an important game species in the reservoir.	CHANGED
14. Page 40, line 8. Figure 7 shows monthly flow, not hourly flow.	CHANGED
15. Page 44, line 4. Insert C after 1-3.	CHANGED
16. Page 44, line 8. Delete "could."	
17. Page 51, paragraph 2. "Cooler summer winter" does not make sense.	CHANGED
18. Page 55, line 4. Change 1983 to 1987.	CHANGED
19. Pages 52 - 60. A comment is made under both the bald eagle and the osprey regarding reductions in nesting habitat through tree cuttings for developing elk range. Certainly any loss would have been from potential and not actual habitat because of the Corps of Engineers' close cooperation and coordination with the U.S. Fish and Wildlife Service and others like the state. Of the timber cut, the question may be how much was reproduction, mature and old growth and just as importantly, what was the species composition?	NOTED
20. Pages 55 - 60. The 25,900-acre figure assumes that no other mitigating circumstances are involved; however, this report notes that logging is particularly disruptive, and much of this occurs off-project where the Corps has no control. In addition, the hard-core elk mitigation area should not be included, since it was surely obvious to all concerned that the browse development (logging) would adversely impact other species. The agencies were apparently willing to accept those losses in return for gains in elk numbers.	This fact was only obvious to the agencies originally involved with developing the elk mitigation area. Not all responsible parties were included in these discussions and plans.
21. Page 56, table 4. We do not agree that lands classified as Wildlife Management-Moderate will be lost as possible nesting sites. Check definition in Appendix B of the report.	NOTED
22. Page 62. The Corps conducted a survey in 1986 and identified 70+ nests of which 50+ were active.	NOTED
23. Page 64, paragraph 2. First sentence does not make sense.	CHANGED

24. Page 65. Although the first paragraph says that nothing is known, the second paragraph proposes some explanations. The two paragraphs should be tied together better.

CHANGED

25. Page 68, paragraph 3, line 3. Change the word "of" to "by."

CHANGED

26. Page 69. Mention should be made of the possible effects on deer migration of the long unbroken stretches of concrete barricades along Highway 12. These have been placed at the edge of the roadway, often creating a severe barrier.

NOTED

27. Page 73, line 4. Insert "to" between the words "detrimental" and "river."

CHANGED

28. Page 78. This appears to be a much more reasonable assessment of the value of riverine habitat like the Clearwater to nesting waterfowl than the assessment proposed by the State of Idaho in its report.

NOTED

29. Page 89, paragraph 1, last line. Delete "fish."

CHANGED

30. Page 92, paragraph 1, line 4. Delete "pristine."

NOTED

31. Page 94. The reduction in winter survival of waterfowl is unlikely, since it is relatively easy for them to leave should the food supply dwindle. No mention of reduced winter survival was made in the impact assessment on pages 80-82.

It was the intention of the authors to present all possible impacts positive and negative, discernable from the available information. The interagency work group determined that there was not enough information to quantify negative or positive impacts to selected target species. Impacts were not quantified and no specific conclusions were reached. It is believed the summary reflects the best possible conclusion given the paucity of information and the need to objectively analyze impacts to wildlife and not to participating agencies.

32. Page 92 (Summary). Conclusions reached in the summary are not substantiated in the previous discussions. The entire report was written from the standpoint that only negative impacts were possible from the construction of Dworshak. Approached from a more objective mind-set, one could easily reach different conclusions:

(a) Bald Eagle. Report states that 25,900 acres of "historical nesting habitat" were lost. However, information presented on pages 52-60 indicates very few nests ever existed in the study area. The FWS endangered species biologist stated that the North Fork Clearwater was never an area of high value to nesting bald eagles. He also expects that a nesting pair near Dworshak would not be unexpected in the near future because of the rapidly expanding anadromous fish runs due to Dworshak and Lower Snake River mitigation programs. Additional nesting pairs may be considered enhancement in the Dworshak study area.

NOTED

(b) Osprey. Report indicates feeding habitat increased nearly ten-fold in the study area, but went on to suggest that a deterioration of prey base may cause a decrease in the osprey population. Information on pre-project conditions shows ospreys were nesting in the lower North Fork, but numbers or densities are not available. It is entirely plausible that osprey nesting has been significantly enhanced on the North Fork because of the reservoir. On the lower river nesting does not occur, but information on page 63 states that osprey nesting has never been documented along that stretch, thereby negating the question of impacts from Dworshak. NOTED

(c) White-tailed and mule deer. Summary indicates no detectable losses, but speculates possible impacts on movements. Again, this really is stretching for impacts. No mention of the improved riparian habitats for white-tailed deer is made. NOTED

(d) Beaver. Impacts on riparian habitat may be positive for aquatic furbearers. The authors admit that impacts are unknown. NOTED

(e) Canada Geese and Mallard. Suggested impacts are purely speculative and any positive benefits of island stabilization and riparian development were not mentioned. It is very difficult to understand how riverine benthic changes such as described can reduce "winter survival." NOTED

(f) Great Blue Heron. Described losses are again speculative and it appears the authors are struggling to find some type of negative impact. NOTED

(g) Yellow Warbler. Summary indicates some future positive impacts will be seen for this species but does not acknowledge the extensive increases in warbler habitat which have already occurred along the lower river. NOTED

(h) Chukar and California Quail. Again, the report should admit that riparian increases along the lower river have likely improved conditions for these upland game species. The report is written from a negative viewpoint.