ALBENI FALLS

WILDLIFE PROTECTION, MITIGATION, AND ENHANCEMENT PLAN

Final Report 1987

Prepared by

Robert C. Martin, Wildlife Biologist
H. Jerome Hansen, Wildlife Biologist
G. Allyn Meuleman, Project Leader
Idaho Department of Fish and Game
600 S. Walnut
P.O. Box 25
Boise, Idaho 83707

Prepared for

Jim Meyer, Project Manager
U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, Oregon 97208
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Table of Contents

List of Tables

List of Figures

List of Appendices

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ABSTRACT

Under direction of the Pacific Northwest Electric Power Planning and Conservation Act of 1980, and the subsequent Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program, a wildlife impact assessment and mitigation plan has been developed for the U.S. Army Corps of Engineers Albeni Falls Project in northern Idaho.

The Habitat Evaluation Procedure (HEP) was used to evalua-te pre- and post-construction habitat conditions at the Albeni Falls Project. There were 6,617 acres of wetlands converted to open water due to development and operation of the project. Eight evaluation species were selected with impacts expressed in numbers of Habitat Units (HU's). For a given species, one HU is equivalent to one acre of prime habitat. The Albeni Falls Project resulted in estimated losses of 5,985 mallard HU's, 4,699 Canada goose HU's, 3,379 redhead HU's, 4,508 breeding bald eagle HU's, 4,365 wintering bald eagle HU's, 2,286 black-capped chickadee HU's, 1,680 white-tailed deer HU's, and 1,756 muskrat HU's. The yellow warbler gained 71 HU's. Therefore, total target species estimated impacts were 28,587 HU's. Impacts on peregrine falcons were not quantified in terms of HU's.

Projects have been proposed by an interagency team of biologists to mitigate the impacts of Albeni Falls on wildlife. The HEP was used to estimate benefits of proposed mitigation projects to target species. Through a series of proposed protection and enhancement actions, the mitigation plan will provide benefits of an estimated 28,590 target species HU's to mitigate Albeni Falls wildlife habitat values lost.

INTRODUCTION

The Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Public Law 96-501) directed that measures be implemented to protect, mitigate, and enhance fish and wildlife to the extent affected by development and operation of hydropower projects on the Columbia River System. This Act created the Northwest Power Planning Council, which in turn developed the Columbia River Basin Fish and Wildlife Program. This Program established a four-part process:

1) Wildlife Mitigation Status Reports -- to identify mitigation proposed, mitigation required, mitigation implemented, and current studies and planning;

2) Wildlife Impact Assessments -- to quantify wildlife and habitat impacts using the best scientific information available;

3) Wildlife Protection, Mitigation, and Enhancement Plans -- to provide a plan to mitigate wildlife and habitat losses pursuant to Sections 4(h)(5) and (6) of the Pacific Northwest Electric Power Planning and Conservation Act of 1980;

4) Implementation of protection, mitigation, and enhancement projects -- to mitigate wildlife habitat losses that resulted from development and operation of hydroelectric facilities.

This mitigation plan for the Albeni Falls Hydroelectric Facility was developed to fulfill requirements of Sections 1003(b)(2) and (3) of the Columbia River Basin Fish and Wildlife Program. Specific objectives of wildlife protection, mitigation, and enhancement planning for Albeni Falls included:

1) Estimate the net effects on wildlife resulting from hydroelectric development and operation.

2) Select target wildlife species, and identify the current status, management goals, and plans for the target species.

3) Develop protection, mitigation, and enhancement goals and objectives for the target wildlife species.

4) Develop management plans (recommended actions) for the protection, mitigation, and enhancement of the target wildlife species.

Agencies that actively participated in planning sessions included the U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service (USFS), Upper Columbia United Tribes (UCUT), and Idaho Department of Fish and Game (IDFG). Throughout preparation of this plan, we consulted and coordinated with the above agencies and tribes, Bonneville Power Administration (BPA), Northwest Power Planning Council, and Pacific Northwest Utilities Conference Committee. This plan was funded by BPA.

FACILITY DESCRIPTION

Albeni Falls Dam is located at mile 90 on the Pend Oreille River in Bonner County, Idaho, about two miles upstream of the Idaho - Washington border. All of Pend Oreille Lake is considered the dam's reservoir -- a total of 94,600 acres within 226 miles of shoreline. The reservoir can store 1,155,OOO usable acre-feet. Lake level is regulated between a minimum elevation of 2,049.7 feet (usually drawn down to 2,051) and a maximum of 2,062.5. The maximum is usually reached during June and maintained until Labor Day. Lowest levels are reached in the winter (USACE 1981).

Albeni Falls Dam was authorized by the Flood Control Act of 1950. Authorized purposes of the dam include power generation, flood control, navigation, recreation, and fish and wildlife conservation (USACE 1981). As of September 30, 1987, 95% of the total project costs were allocated for repayment from power revenues: 4% were allocated to recreation, 0.5% to flood control, and 0.4% to navigation (BPA 1987).

Construction began in January 1951. Regulation of water levels began in June 1951. Construction was completed in 1955. The dam is a concrete gravity gate-controlled structure 90 feet high and 755 feet long. The power plant's three generators have a capacity of 42.6 megawatts (USACE 1981).

HISTORICAL BACKGROUND

Chaney and Sather-Blair (1985) summarized wildlife species, habitat conditions, and status of mitigation at the Albeni Falls Project.

"PRE-CONSTRUCTION

"The proposed reservoir at normal pool was projected to impact 6,300 acres of land and 88,300 surface acres of water above the dam (USFWS 1953). The land area was subject to spring and early summer flooding. Though the USFWS (1953) did not quantify extent of vegetation communities to be inundated by the reservoir, they did describe the more common communities: 'The principal cover types on the lands to be flooded are broadleaf trees, coniferous trees, brush, meadow, grassland, marsh, and agricultural crops. The dominant plant species of the lake shore and river deltas are black cottonwoods, alder, Douglas fir, western red cedar, lodgepole pine, willow, hawthorn, snowberry, spirea, cinquefoil, sneezeweed, sedges, redtop, and bluejoint. The most abundant aquatic plants in Pend Oreille Lake are waterweeds, pondweeds, spike rushes, arrowgrasses, horsetails, and water smartweeds.'

"Lake Pend Oreille has historically been an important waterfowl migration and wintering area. Twenty-three species of waterfowl have been recorded for the area (USACE 1981), most notable among these are the large concentrations of redheads and canvasbacks. Unfortunately, no quantitative data were found to give any indication of waterfowl numbers before the project.

"Lowlands along the north shore of Lake Pend Oreille including the deltas of the Clark Fork and Pack Rivers were utilized by large concentrations of migratory waterfowl. These shallow water areas were known to be very productive of waterfowl food plants, both emergent and submerged (USFWS 1960).

"Mallards, goldeneyes, and wood ducks were the principal nesting species identified by the USFWS (1953), but other species such as the Canada goose, green-winged and cinnamon teal, and American wigeon probably also nested (USACE 1981). Nesting success was limited due to chronic flooding of nesting habitats during early June.

"Furbearing animals were abundant in the project area (USFWS 1953): Principal species were muskrat, beaver, skunk, weasel, mink, and otter.

"Moose, elk, mule deer, white-tailed deer, and black bears are all native to the region. White-tailed deer were common in the project area, particularly in the Clark Fork and Pack River Delta areas (USFWS 1953). Ruffed and blue grouse were the principal upland game birds present. Pheasant habitat was limited, and the small number of wild birds were annually supplemented by stocking. The

pre-construction presence of additional species can be inferred from recent reports on contemporary wildlife populations in the project area (USACE 1981).

POST-CONSTRUCTION

"Reservoir operations were expected to substantially alter vegetation on the 6,300 acres lying between the pre-construction meander line and post-construction normal pool elevations (USFWS 1953). Maintaining reservoir water levels during the summer was expected to improve waterfowl nesting over pre-project conditions. Fall drawdown of the reservoir was expected to drain most areas providing food for waterfowl with a corresponding reduction in waterfowl use of the area in late fall and winter. This negative impact was estimated to far exceed the positive impact of improved nesting habitat (USFWS 1953).

"Later the USFWS (1960) reported post-construction wildlife losses larger than the 1953 pre-construction estimates. The affected 6,300 acres of land, once agricultural lands, meadow, brush, and deciduous tree habitats, were now largely mudflats December to' April. The USFWS (1960) also noted that '...the drawdown and shallow water areas have become less productive of waterfowl food plants. Native grasses and sedges have been eliminated. Submerged aquatic plants, which flourished under natural conditions in the permanently flooded shallow areas, have become less abundant, particularly during the fall migration period for waterfowl.' However, the USFWS noted that duck use of the lake appeared to remain largely stable during spring and fall migration. Current waterfowl censuses conducted by the IDFG from 1970 to 1982 estimate from 47,500 to 142,600 ducks, from 493 to 14,459 geese, and 225 tundra swans winter on the lake annually. The wintering population of redheads is 98% of Idaho's total and 20% of the Pacific Flyway population (USACE 1981).

"The anticipated new growth of vegetation along the lake shoreline was not established by 1960 and as a result waterfowl production in the area was reduced from pre-project levels. Brood counts in 1958, 1949, and 1960 indicated a 50% drop in duck production (USFWS 1960).

"Moose, elk, mule deer, white-tailed deer, and black bears are still present in the region (USACE 1981, 1983). The reservoir inundated approximately 4,000 acres of white-tailed deer range and 1,000 acres of black bear habitat. All big game habitats below 2,062.5 feet in elevation were eliminated. However, some white-tailed deer were found to return to the Clark Fork Delta area during the winter low-water period (USFWS 1960).

"Post-construction stabilization of Pend Oreille Lake and River from June to October and a 10-13 foot winter drawdown were estimated to result in rapid elimination of muskrat and beaver within the impoundment. Otter, mink, and weasel habitats were expected to be eliminated within the reservoir area, but these

animals were expected to re-establish themselves along the post-construction shoreline. These animals are currently found in the area, though they are not abundant (USACE 1981, 1983). Pheasant, ruffed grouse, and blue grouse habitats were eliminated within the 6,300 acre area affected by the water level fluctuations. A wide variety of nongame species also were displaced and/or lost because of habitat elimination within the impounded area.

"Raptors that nest in the area include bald eagles, ospreys, marsh hawks, and owls. The bald eagle is listed as an endangered species in Idaho and one active nest has been located on Lake Pend Oreille (pers. commun., USFWS). [In 1988, there were six nesting pairs.] The number of wintering bald eagles averaged 54 birds from 1971 - 1979 with the largest number observed in 1976 at 86 birds (USACE 1981). [In the winter of 1986-87, the peak wintering bald eagle count was 429.] Lake Pend Oreille also supports one of the largest nesting concentrations of ospreys in the western United States (pers. commun., USFWS)."

WILDLIFE MITIGATION STATUS

In 1953, the USFWS, after consultation with IDFG, recommended that 8,140 acres of land and shallow water areas be acquired for mitigation and be transferred to IDFG for administration and management (USFWS 1953).

On August 2, 1957, the USACE executed a license granting the IDFG the right to develop and manage about 3,780 acres of federally-owned project land for wildlife (USFWS 1960). The lands included 926 acres of uplands and 2,854 acres of wetlands. Five-hundred thirteen acres are above water during spring and summer, and available for Department management (IDFG 1986a). The term of the license was for 50 years, beginning September 1, 1956 and ending August 31, 2006. The license was renegotiated and signed by IDFG on March 13, 1984. The term of the new license is 25 years. In addition to the above lands, a subimpoundment was recently constructed on upper Morton Slough.

"The licensed lands are divided into ten management units ranging from one acre to 567 acres along the Pend Oreille River and north end of Pend Oreille Lake. The bulk of the acreage is under custodial management for wildlife habitat by IDFG (pers. commun., IDFG). However, several of the areas have recreational facilities existing or planned (USACE 1981). Approximately 64 acres of the wildlife management areas are or will be directly reduced in valued to wildlife as a result of recreation developments. Additional lands surrounding these areas will probably also be reduced in value as wildlife habitat as a result of greater human disturbances" (Chaney and Sather-Blair 1985).

STUDY AREA

The area evaluated for impacts to wildlife extended from the Clark Fork bridge to Albeni Falls Dam (Figure 1). This included the north shore of Pend Oreille Lake, Bottle Bay, and the Pend Oreille River. The Pend Oreille River portion is a part of Pend Oreille Lake because its water levels are controlled by the Albeni Falls Dam. The study area boundary for all target species except the mallard was the Corps of Engineers Albeni Falls Project boundary. The mallard assessment area was extended 100 meters uphill from wetlands where the Corps project boundary did not include this primary dabbling duck nesting habitat.

This wildlife impact assessment did not include lands around the deep water portion of Pend Oreille Lake between Sagle Slough and Clark Fork Delta (except Bottle Bay). The south arm of the lake is characterized by steep, rocky shorelines that have not been noticeably impacted by hydroelectric development and operation.

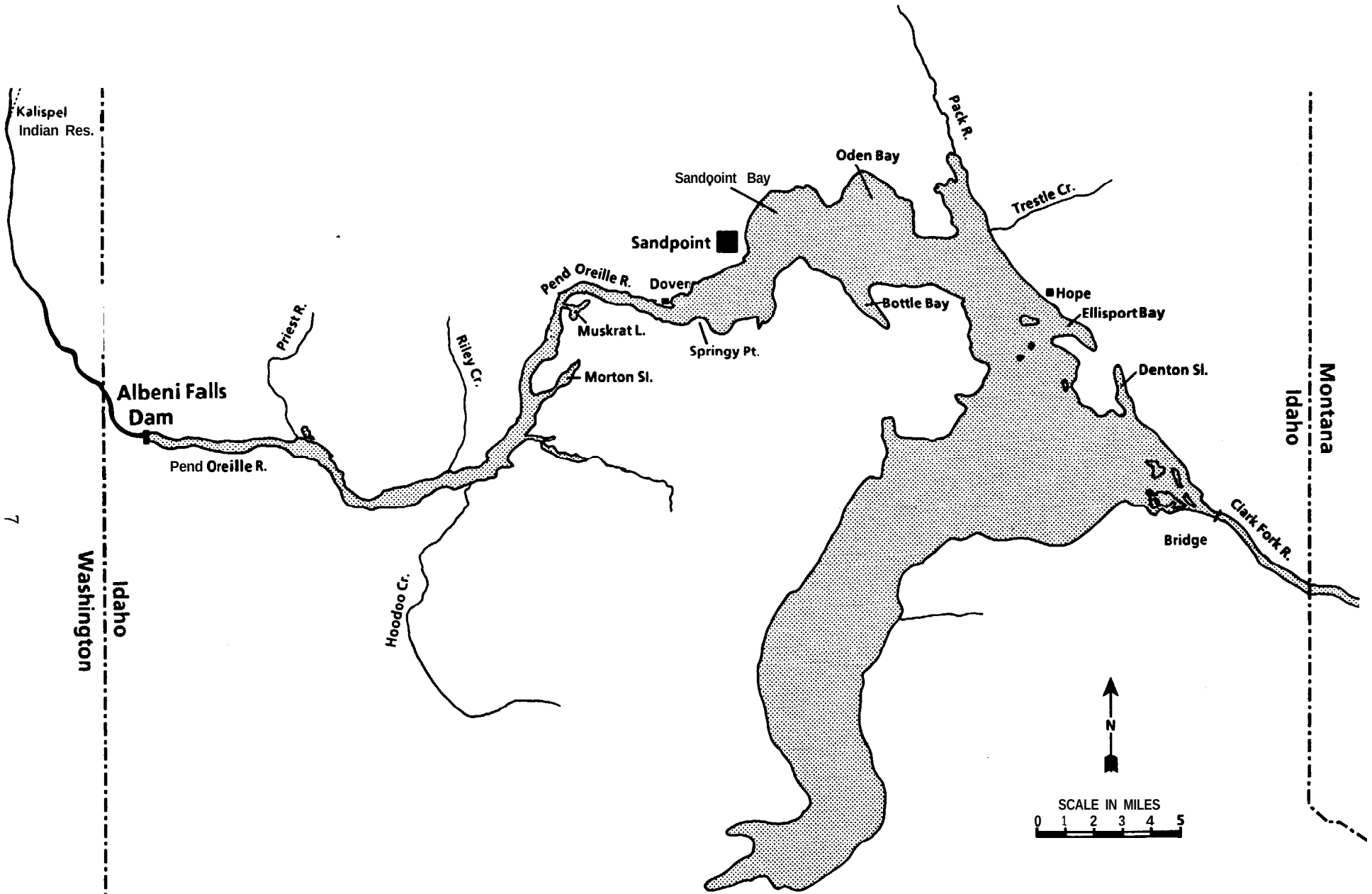

Fig. 1. Albeni Falls Project and vicinity.

METHODS

SELECTION OF TARGET SPECIES

The interagency work group chose target species to represent wildlife and habitats affected by the hydropower facility and/or potentially benefited by mitigation projects. The species were chosen because they are of high priority according to state or federal programs, and/or because they are indicator species used to best describe habitat conditions for groups of species with similar habitat needs.

The mallard and muskrat were chosen to represent dabbling ducks and aquatic furbearers, respectively, and because of their ecological tie to herbaceous wetlands. The black-capped chickadee was chosen to represent species dependent on forested wetlands. The yellow warbler was chosen to represent species dependent on scrub-shrub wetlands. The redhead was chosen to represent diving ducks in this area that provides important wintering habitat. The bald eagle, Canada goose, peregrine falcon, and white-tailed deer were chosen because of their regional or national significance, and because they are of high priority in state or federal programs.

ASSESSMENT OF HYDROELECTRIC IMPACTS

The interagency team of biologists used the Habitat Evaluation Procedure (USFWS 1980) to estimate hydroelectric impacts to wildlife in terms of Habitat Units. For a given species, one HU is equivalent to one acre of prime habitat. For each target species evaluated, the interagency team estimated the effects of the project on the species' habitat, measured with the Habitat Suitability Index (HSI). An HSI is a number between 0 and 1.0. It is a numerical index that represents the capacity of a given habitat to support a selected fish or wildlife species. Species models, comprised of measurable habitat variables, were used during HSI determination. Project impacts to each target species were calculated as the difference between present-day (post-construction) Habitat Units and pre-construction Habitat Units provided in the study area.

Habitat changes

Habitat quantity and quality in the study area were assessed by quantifying:

1) Cover type acreage changes that have occurred.

2) Acreage losses that continue occurring because of erosion.

3) Habitat changes that have affected habitat suitability for wildlife target species (discussed in each target species' section).

The study area boundary line for cover type acreages (Corps project boundary) was drawn onto 1:24,000 orthophotos for the Clark Fork to Oden Bay areas, and 1:24,000 orthoquads for the Sandpoint Bay to Albeni

Dam areas. The Corps project boundary was on maps revised through 1969 that ranged from 1:24,000 to 1:9,600. Post-construction cover types were already delineated on the orthophoto and orthoquad base maps, which are a product of the Fish and Wildlife Service's National Wetland Inventory. The maps were drawn from 1981 color infrared aerial photography. Classifications were verified during field work sessions. They were also checked against 1:12,000 aerial color photography, and were felt to be very accurate.

Pre-construction vegetation mapping was done using a combination of 1935 (1:20,000) and 1950 (1:12,000) black and white aerial photographs, along with USFWS (1953) pre-construction cover type maps. Cover types were drawn onto the orthophoto and orthoquad base maps for all areas except the Clark Fork and Pack River Deltas, where measurements were made directly on USFWS (1953) cover type maps. Pre- and post-construction cover type acreages were measured with digital planimeters. For the purposes of mapping, it was assumed that all terrestrial areas inundated at the post-construction summer pool level (2,062.S feet) were wetlands under pre-construction conditions. On the USFWS habitat maps, it was not clear in some habitats, especially the "agriculture" cover type, what constituted upland and what was wetland. The work group agreed that all inundated habitat was probably wetlands, and that if any uplands were inundated they would have been very limited in extent.

Many habitat changes occurred as a result of the Corps acquiring private lands, which are now managed as project lands. These changes were considered during the Habitat Evaluation Procedures for each target species. This gave credit for all post-construction habitat changes that have occurred as a result of Corps acquisition of private lands and subsequent Corps operation of the project.

Annual erosion losses were examined closely in the Clark Fork Delta, and generally in the entire project area. Pre- and post-construction aerial photography was examined during estimation of annual erosion losses. Field personnel observations of erosion trends were important during these estimates.

Mallard

A breeding mallard model (Appendix B) drafted specifically for Pend Oreille Lake was used in this evaluation. Mallard breeding habitat& suitability was examined in areas supporting palustrine wetland vegetation. The assessment area included all project lands, and was extended 100 meters uphill from wetlands where the Corps project boundary did not include this primary duck nesting habitat. Mallard HSI's were determined from a combination of mapwork in 12 areas and field data from 14 sample sites. Variables and sampling methodology are explained in Appendix B.

Canada Goose

Project impacts on breeding Canada geese were quantified in the study area. A breeding season model (Appendix B) was developed for the study area. The study area was then subdivided into 15 areas. The work group estimated values for habitat variables in each area using aerial photographs, wetland maps, and knowledge of the areas.

Redhead

Project impacts on wintering redheads were estimated in Oden Bay and Sandpoint Bay, and the Pend Oreille River downstream to Dover. The redhead model used (Howard and Kantrud 1983) recognized that redhead winter habitat quality depends on the abundance of aquatic macrophytes, their relative occurrence within feeding depths, and human disturbance in feeding areas. Optimal winter habitat is comprised of abundant submerged plants occurring in shallow water (O-l meter) feeding areas free from human disturbance. Following the redhead model (Howard and Kantrud 1983). acres of available foraging habitat were quantified for pre- and post-construction conditions in each of three feeding depth classes: O-l meter, l-2 meters, and 2 meters to the depth limit of preferred submergent plants. Depth contours were drawn onto U.S. Geological Survey maps that show depth soundings at many points in the lake. The depth limit of preferred submergents was calculated assuming that Chara spp. is the deepest growing forage species and that it grows to the average photic depth Reiman (1975) reported for the lake. Depth limits were based on average water levels July to September, because that is the growth period for aquatic plants in the lake (M. Falter, Univ. of Idaho, pers. commun.). Within each depth class, the work group estimated habitat suitability values. Net impact to wintering redheads was the difference between Habitat Units provided now and Habitat Units provided prior to hydroelectric development and operation.

Bald Eagle

A bald eagle model (Appendix B) was used to assess project impacts on breeding and wintering bald eagles. The work group limited the evaluation to the terrestrial acreage of the Clark Fork Delta, Pack River Delta, and Pend Oreille River areas. It was felt there were no significant changes in habitat values in the remainder of Pend Oreille Lake that were related to hydroelectric development and operation.

The work group felt that most measurable bald eagle impacts were the result of the loss of forested wetlands and terrestrial habitat in the Clark Fork and Pack River Deltas: and similar loss of habitat in the Pend Oreille River area, accompanied by increased project-related human disturbance. The work group estimated habitat values for model variables to each of four areas: Clark Fork Delta, upper Pack River Delta, lower Pack River Delta, and Pend Oreille River. During HSI evaluation, the work group examined aerial photography, wetland maps, field data collected at 11 sites, and available literature.

Black-capped Chickadee (Forested Wetlands)

Habitat quality was evaluated for the black-capped chickadee, which is an indicator species for deciduous forested wetlands. The model used (Schroeder 1983) assumes habitat quality is best represented by canopy coverage of trees, height of trees, and availability of snags for nest sites. Field data for tree height and snag density were collected in the Clark Fork and Pack River Deltas. Canopy coverage was estimated using dot-grid sampling of 100 random points on both pre- and post-construction aerial photographs.

Yellow Warbler (Scrub-shrub Wetlands)

Habitat quality was evaluated for the yellow warbler as an indicator species for deciduous scrub-shrub wetlands. The model used (Schroeder 1982) assumes habitat quality is best represented by canopy coverage of shrubs, height of shrubs, and the relative frequency of hydrophytic shrubs compared to all shrubs present. Field data for shrub height and hydrophyte occurrence were collected in the Clark Fork Delta, Pack River Delta, and Pend Oreille River areas. Dot-grid canopy coverage sampling consisted of 100 random points on aerial photographs.

White-tailed Deer

Habitat quality for wintering whitetails was evaluated for pre- and post-construction conditions in deciduous and scrub-shrub wetlands. The winter forage portion of a whitetail model (Appendix B) was used to estimate winter HSI's in these two cover types. The model assumes that the most important component of whitetail winter habitat is availability of browse within five feet of the ground, and that snow depth and security cover do not limit whitetails in the study area. Field data were collected in the Clark Fork and Pack River Deltas.

Muskrats

The work group agreed that habitat suitability for muskrats in the study area was limited by low water conditions. Thus, habitat values for variables in the muskrat model (Allen and Hoffman 1984) were determined for low water conditions. The muskrat evaluation considered field data from 12 sites, water operations information, low-water aerial photography, and dot-grid canopy coverage sampling of 240 random points in emergent wetlands. Habitat suitability values were determined separately for slough/riverine and deep-water emergent wetland'types in eight areas within the study area.

ASSESSMENT OF MITIGATION PROJECT BENEFITS

Habitat Evaluation Procedure

HEP was used to estimate the benefits of proposed mitigation projects in terms of Habitat Units. For each target species expected to benefit from a mitigation project, the interagency team of biologists estimated the effect the project would have on the species Habitat Suitability Index (HSI). Species models, comprised of measurable habitat variables, were used for guidance during HSI estimation. As much as possible, techniques to estimate HSI's and HU's were performed consistent with techniques used during the wildlife impact assessment.

Mitigation Crediting

Estimated benefits of protection actions and enhancement actions were credited differently as mitigation. Mitigation credit for protection of private land was the total estimated HU's that would be provided by the parcels after fee-titles or conservation easements are acquired (willing sellers only), and after the area is enhanced through management actions. Mitigation credit for enhancement actions on lands administered by federal or state land management agencies was the estimate of increased HU's provided on the project area as a result of the management action.

These methods and the accounting methods in the wildlife impact assessment were used in an effort to make mitigation accounting easier to understand than if the more appropriate technique of annualizing (USFWS 1980a) had been used. These simplified methods have resulted in liberal estimates of mitigation project benefits and conservative estimates of losses attributable to hydropower.

Losses attributable to the Albeni Falls Hydroelectric Facility were estimated as if they had occurred at one point in time, although losses of available wildlife habitats have been occurring for about 37 years. Likewise, mitigation credit for protection/enhancement projects has been estimated as if it will occur as soon as projects are implemented. However, benefits may not occur for several years until habitats improve and wildlife increase their use of the enhanced areas.

If projects proposed in this plan are completed by 1998 and take only five years to produce the benefits estimated, by the year 2005 there will be only two years of benefits to mitigate 55 years of wildlife production losses. We make this point to acknowledge the results of using simplified methods for mitigation accounting. The decision to use the simpler methods was based, in part, on the assumption that annual operation and maintenance would be funded for the life of the Albeni Falls Facility. As long as the dam is in place, inundation of wildlife habitat will continue, and hands-on management at enhancement projects will be necessary if the continuing hydropower impacts are to be mitigated to the extent wildlife is being affected.

ASSESSMENT OF MITIGATION PROJECTS COSTS

Advance Design

This includes the estimated costs of preparing management plans for enhancement work, conducting baseline surveys and inventories, identifying willing sellers, soliciting bids and quotes, and associated labor and travel. All options of acquisition of fee-titles versus conservation easements will be examined. The level of operation, maintenance, and monitoring effort required after project implementation will be determined as part of the management plan. Costs are based on estimates provided by biologists and/or engineers.

Implementation

This includes estimated costs of protection (fee-title acquisition or easement costs), appraisals, legal fees, and enhancement measures necessary to initially develop mitigation project areas. A new Idaho Conservation Easement law was passed in 1988, providing the legal mechanism for private landowners to create conservation easements on their property. The costs of acquiring conservation easements from willing sellers of private parcels is expected to be similar to actual fee-title acquisition of the same parcels.

Enhancement costs include actions to initially improve wildlife habitat, such as building dikes and islands, planting vegetation, and fencing. "Enhancement" in the context of this plan "...is not a new or additional obligation, but a means of fulfilling existing protection and mitigation obligations under the unique circumstances presented by the Columbia River power system." (House of Representatives Rept. 96-976 Part II, 96th Congress, 2nd Session, in a clarification of Power Council responsibilities under the Northwest Power Act). Implementation costs are based on estimates provided by biologists and/or engineers.

Operation and Maintenance

These are recurring annual costs necessary to achieve and sustain a project's estimated benefits to wildlife. These efforts are necessary for projects to continue providing wildlife benefits, thereby protecting ratepayers' investments in mitigation. Operation and maintenance includes work such as fence maintenance, weed control, water level control, nesting and perching structure maintenance, grazing' management to maintain desired wildlife habitat conditions, island rehabilitation, and associated labor and travel. Costs are based on estimates provided by biologists.

Monitoring

This includes the cost of periodic inventory and monitoring of all mitigation lands. These efforts are necessary for projects to continue providing wildlife benefits, thereby protecting ratepayers' investments in mitigation. Wildlife habitat monitoring consists of repeatedly measuring habitat or population variables to infer changes in

capability of the land to support wildlife (Cooperrider et al. 1986). After protection and/or enhancement activities, habitat features required by target species will be measured periodically to assess changes in habitat values and the effectiveness of the mitigation measures. Habitat monitoring will be accompanied by population measurements to confirm habitat/population relationships. Using adaptive management, mitigation techniques will be changed if monitoring indicates that the desired mitigation results are not being obtained. Biologists provided monitoring cost estimates.

RESULTS AND DISCUSSION

HABITAT CHANGES

In their pre-project evaluation of Albeni Falls impacts the USFWS (1953) reported the following:

> "The principal cover types on the lands to be flooded are broadleaf trees, coniferous trees, brush, meadow, grassland, marsh, and agricultural crops. The dominant plant species of the lake shore and river deltas are black cottonwood, alder, Douglas fir, western red cedar, lodgepole pine, willow, hawthorn, snowberry, spirea, cinquefoil, sneezeweed, sedges, redtop, and bluejoint. The most abundant aquatic plants in Pend Oreille Lake are waterweed, pondweeds, spikerushes, arrowgrass, horsetail, and water smartweed.
>
> "The luxuriant vegetation of the meadow and marsh areas seems to thrive on the spring inundation, which usually peaks in June. Rapid growth is apparent as the water recedes. Crops on the small tracts of agricultural lands are usually rotated from two years of grain (fall wheat and oats) to four years of grass (timothy, clovers, and smooth brome).
>
> "Stabilization of Pend Oreille Lake at the high level of 2.062.5 feet throughout the growing season may be expected to have a tremendous effect on the vegetative cover. Existing marsh habitat, which is established near the low-water levels, will probably be eliminated by inundation to a depth of about 10 to 13 feet during the entire growing season. This area will probably become more or less barren mudflat when exposed by winter drawdown."

A total of 14,083 acres were quantified by cover type in the study area for pre- and post-construction conditions (Table 1). We measured wetland losses of 6,617 acres within the "fluctuation zone." This acreage supported wetland vegetation prior to construction of Albeni Falls Dam, but presently is open water during the high water period, and exposed mudflats during low water. This impact occurred because high water levels are maintained throughout the summer, rather than the natural conditions of spring flood water receding from the fluctuation zone during the June to July growing period. Vegetation has been lost as a result of this prolonged inundation during the growing season, and because exposed soils have been eroded away.

Erosion is causing ongoing wetland losses as denuded banks are undercut and vegetation is sloughed into the lake. The work group estimated that 30 acres of wetlands are annually being lost to erosion in the study area as a result of hydroelectric project development and operation. Annual erosion-related wetland losses in the Clark Fork Delta alone were estimated to be 15 acres. These ongoing losses are exacerbated by the existence of dams on the Clark Fork River upstream from the delta. Cabinet Gorge and Noxon Rapids Dams impede sediment transport to the delta, providing reduced opportunity for the delta to rebuild.

Prior to Albeni Falls Dam, the inundated area supported extensive herbaceous wetlands comprised of several wetland types depending on water regime. Large areas of wet and dry meadows, and shallow and deep marshes, existed in what is now an open water area during summer and a mudflat area during winter. The water regime gradient during the pre-project period that created the variety of wetland types also created conditions to support a wide variety of wetland plants that are important food sources for waterfowl and aquatic furbearers. Prior to construction, sedges (Carex spp.), spikerushes (Eleocharis palustris), arrowhead (Sagittaria platyphylla), bulrushes (Scirpus spp.), and smartweeds (Polygonum spp.) were listed as common wetland plants around Lake Pend Oreille. These are valuable waterfowl food plants (Martin et al. 1951) and their distribution around the lake today is limited. Today the dominant wetland plants are reed canarygrass (Phalaris arundinacea) and cattails (Typha spp.) (Econ. Inc. 1979), both of which are tolerant of prolonged drawdown. Reed canarygrass has little value as a waterfowl food plant other than marginal forage for Canada geese. This information suggests that there has been a loss in not only the amount of herbaceous wetlands but a loss in plant species diversity and richness that has reduced waterfowl habitat quality.

A similar, yet less obvious change, has likely occurred to the aquatic macrophyte communities that exist in the littoral or photic zone of Lake Pend Oreille. Timing of water levels has been changed by project operations (Figures 2 and 3). Figures 4, 5, and 6 illustrate what has likely occurred to the general distribution of some selected aquatic plants as a result of project operations in Oden Bay.[1] Potamogeton gramineus, P. zosteriformis, and Chara spp. were identified as common in Lake Pend Oreille prior to project construction (USFWS letter to Corps dated December 13, 1950). Potamogeton spp. are considered some of the most important food plants for a wide variety of waterfowl species. Chara spp. is also an important food, particularly for redheads (Martin et al. 1951). The current operations of the project, which keeps summer water levels at elevation 2,062.5 feet, favor aquatic plant species that tolerate deeper water conditions (i.e., Chara spp. and Nitella spp.). The winter drawdown has eliminated, or at least greatly reduced, the optimum growth zone for a variety of aquatic and wetland plants that require shallow water conditions during the growing season (i.e., Potamogeton gramineus and Sagittaria platyphylla). This probable reduction in abundance and diversity of important waterfowl food plants has affected the habitat quality of Lake Pend Oreille.

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1 Bottom profile was plotted using data from U.S. Geological Survey map of Oden Bay. Optimum depth zones for the aquatic plants were identified assuming an average photic zone of 22 feet in Lake Pend Oreille (Reiman 1975) and applying that to depth distribution data for the subject species provided in Davis and Brinson (1979). Average water levels July to September were used, because that is the growth period for aquatic plants in the lake (M. Falter, Univ. of Idaho, pers. commun.).

Table 1. Albeni Falls pre- and post-construction cover type acreages.[1]

Area	Uplands		Herbaceous wetland		Open water		Deciduous scrub-shrub wetland		Deciduous forested wetland		Total palustrine wetland impact
	pre	post	pre	post	pre	post	pre	post	pre	post	
Clark Fork/Denton	389	389	1,603	1,251	1,007	3,036	146	168	2,477	778	-2,029
Hope Peninsula	22	22	0	0	0	0	0	0	0	0	0
Hope Islands	128	128	0	0	0	0	0	0	0	0	0
Ellisport Bay	79	79	55	15	0	40	0	0	6	6	-40
Trestle Creek	19	19	16	0	0	16	0	0	7	7	-16
Pack River	204	204	1,095	111	112	1,556	38	111	582	49	-1,444
Oden Bay	192	192	1,163	22	4	1,145	2	2	0	0	-1,141
Sandpoint Bay	110	110	293	5	34	350	30	2	1	1	-316
Bottle Bay	44	44	9	2	0	7	0	0	0	0	-7
Pend Oreille River	1,186	1,186	2,338	790	399	2,023	145	151	148	66	-1,624
Total	2,373	2,373	6,572	2,196	1,556	8,173	361	434	3,221	907	-6,617
Acreage change	0		-4,376		+6,617		t73		-2,314		

1 From the Corps of Engineers project boundary to the extent of pre-construction terrestrial vegetation.

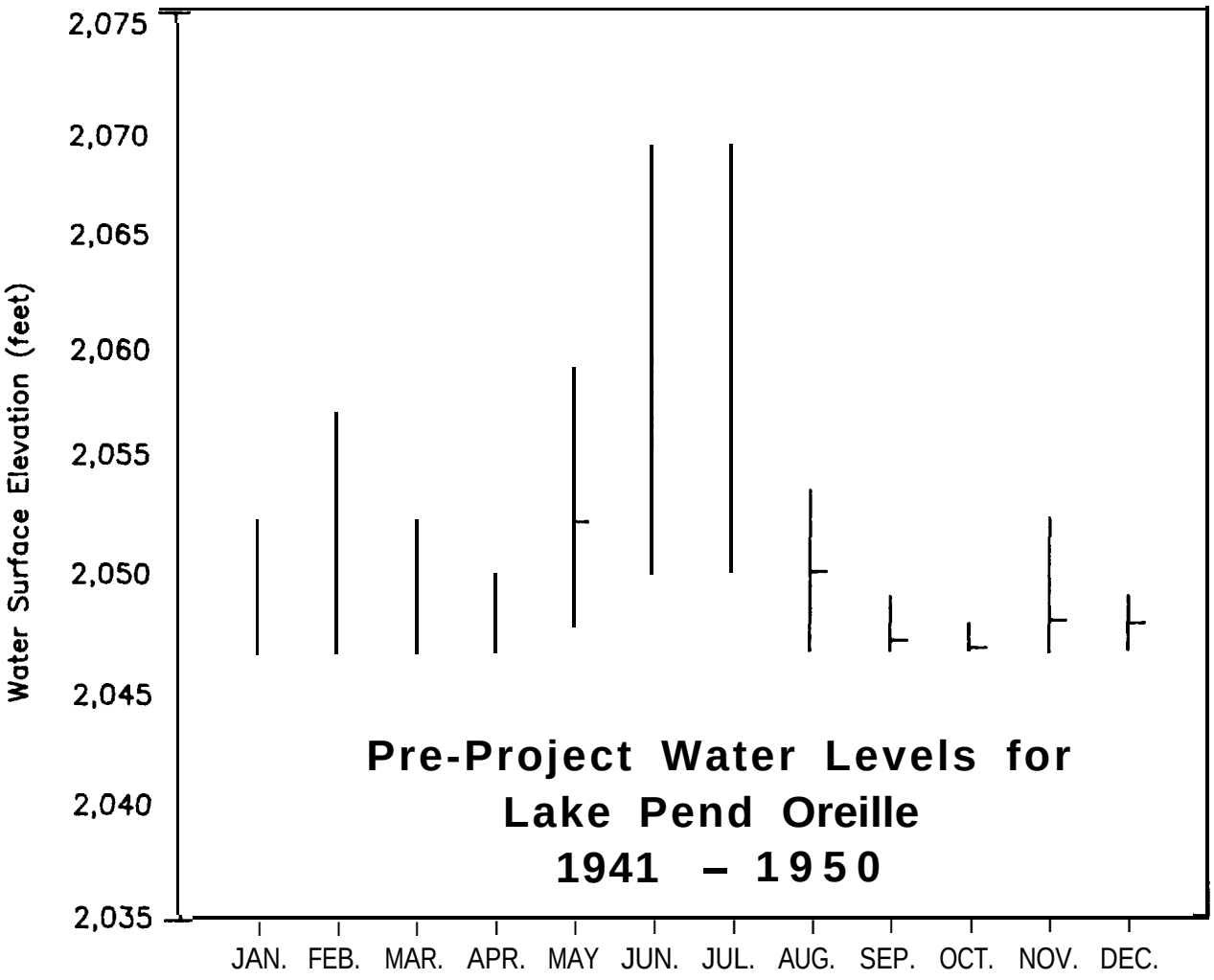


Fig. 2. Pre-project water levels for Lake Pend Oreille, 1941-1950 (mean monthly water surface elevations with average maximum and minimum ranges for period of record).

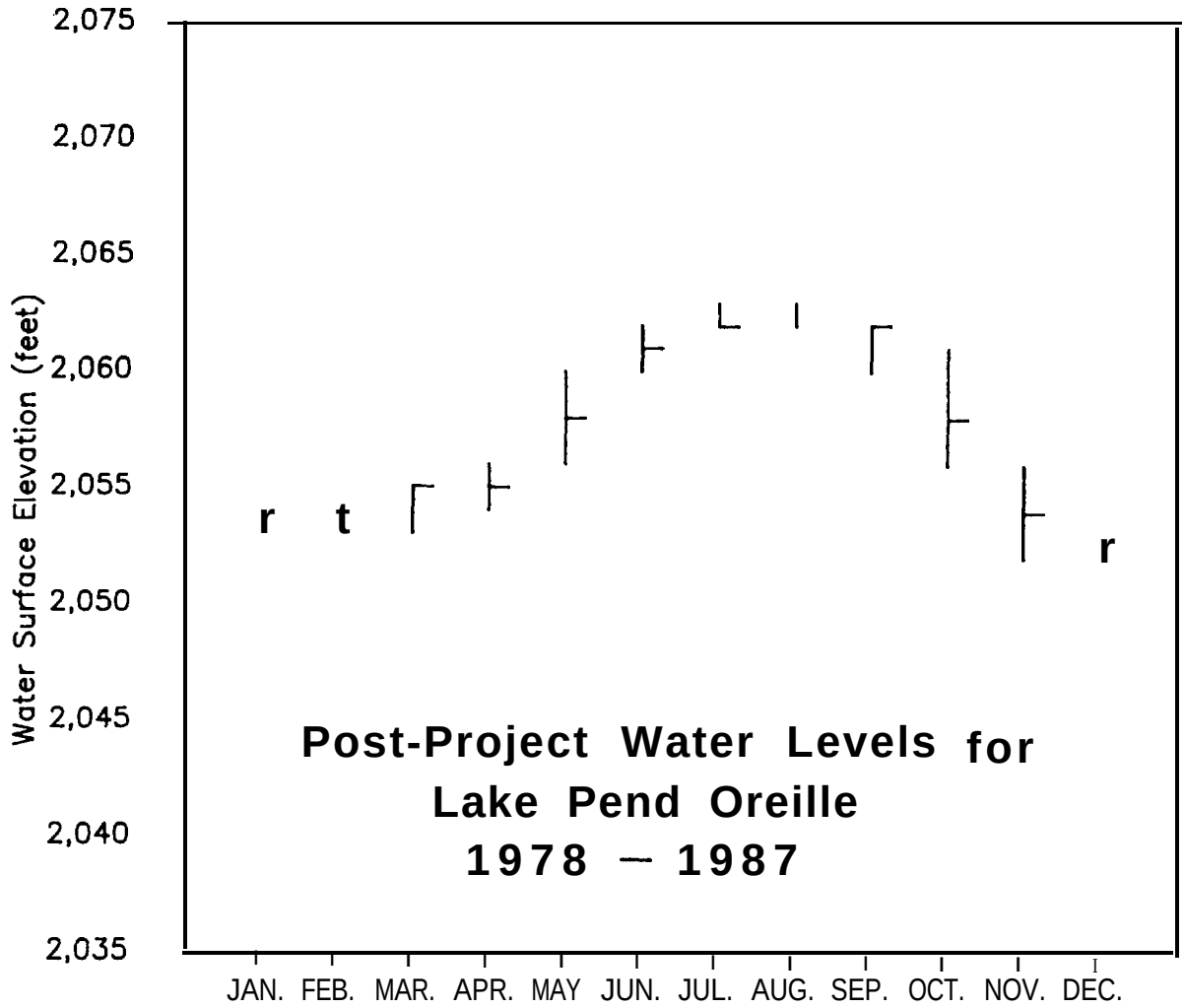


Fig. 3. Post-project water levels for Lake Pend Oreille, 1978-1987 (mean monthly water surface elevations with average maximum and minimum ranges for period of record).

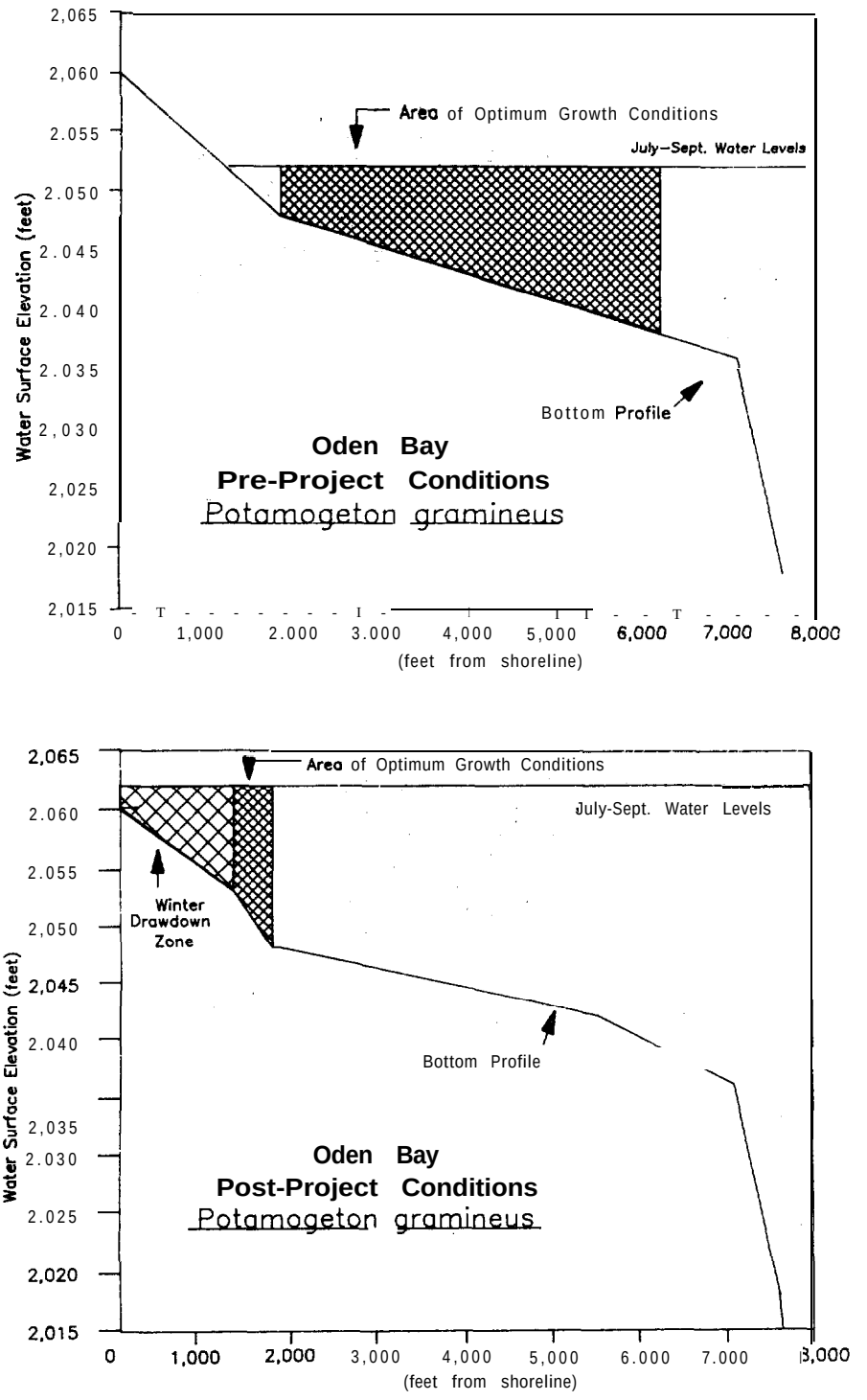


Fig. 4. Oden Bay pre- and post-project conditions, Potamoqeton qramineus.

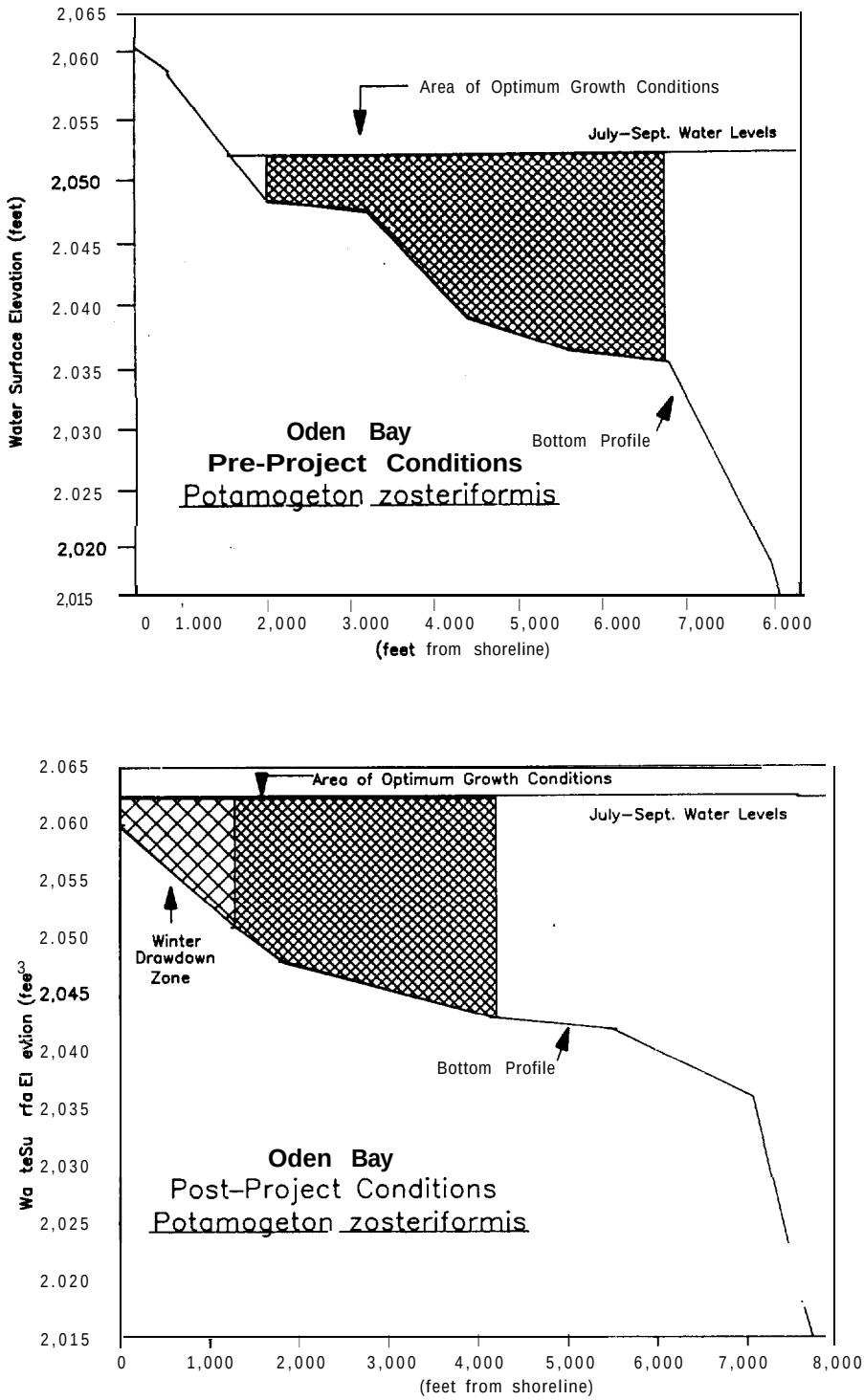
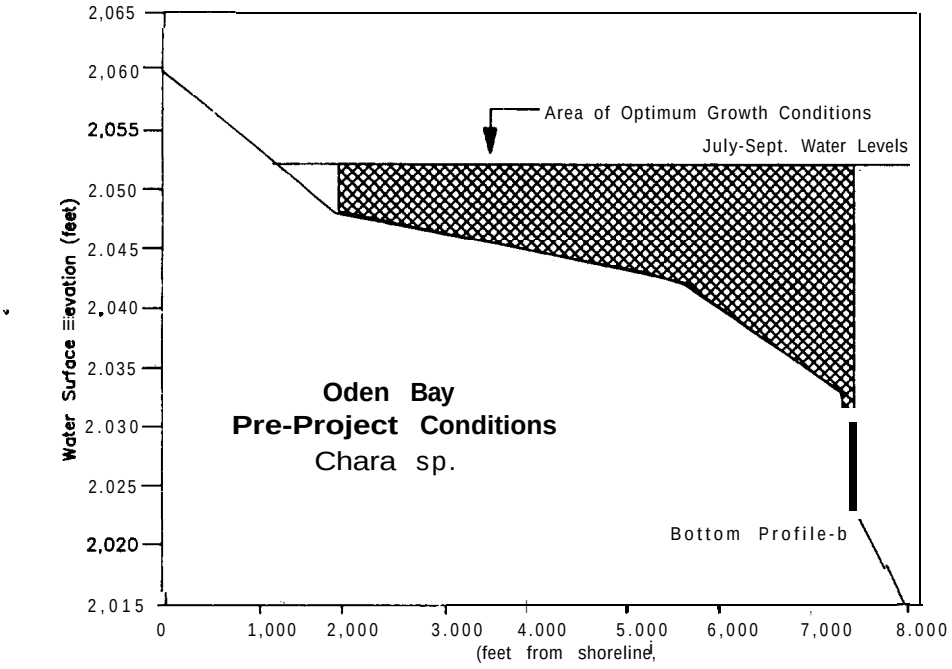


Fig. 5. Oden Bay pre- and post-project conditions, Potamogeton zosteriformis.



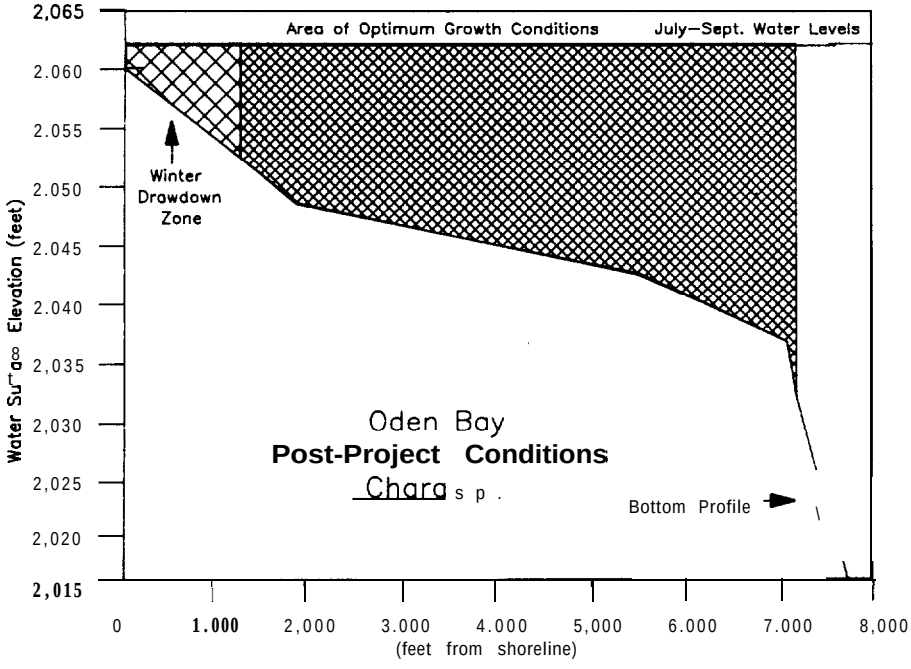


Fig. 6. Oden Bay pre- and post-project conditions, Chara spp.

TARGET SPECIES IMPACTS, STATUS, AND MANAGEMENT GOALS

Mallard

Hydroelectric Impacts. The mallard is a dabbling duck that depends on wetlands for successful nesting and brood production. Their diet consists primarily of aquatic plants; the presence of shallow-water feeding areas is critical (Johnsgard 1975). Nests are generally located on the ground in dense herbaceous vegetation, usually within 100 meters of water (Bellrose 1976). An important habitat-related factor that affects mallard populations is predator-caused nest failure (Bellrose 1976). In summary, mallard production is best in areas that have dense herbaceous vegetation close to water, and that are relatively safe from predators.

A total of 5,985 breeding mallard HU's were estimated to have been lost in the study area as a result of the Albeni Falls Project (Table 2). Mallards were most affected in the areas where extensive herbaceous wetlands were lost (Clark Fork Delta/Denton Slough, Pack River Delta, Oden Bay, Sandpoint Bay, and Pend Oreille River). Other waterfowl species with similar habitat requirements, such as blue-winged and' green-winged teal, American wigeon, and northern pintails, also suffered losses because of the Albeni Falls Project.

Habitat Unit losses occurred because acreage of mallard habitat was reduced, and because habitat quality was reduced on existing post-construction mallard habitat. The model used in this evaluation addressed four mallard habitat needs: food availability, nesting cover, brood cover, and wetland interspersion (Appendix B). Food and nesting habitat quality was very high for both pre- and post-construction conditions, while wetland interspersion and brood cover quality decreased as a result of the project.

Food habitat quality was high because most wetlands in the study area were and are seasonally or semipermanently flooded. Nesting cover quality was high because moderate- to high-quality upland nesting habitat was and is nearby most wetlands. Brood cover habitat quality was high during pre-construction conditions because dense emergent and/or scrub-shrub wetland cover was available at the water's edge during the entire brood-rearing period. Brood cover habitat quality was lower for post-construction conditions because only exposed mud is at the water's edge during the early brood-rearing period.

Wetland'interspersion values decreased from pre- to post-construction periods because acreages and frequency of occurrence of herbaceous wetlands were reduced. The measured decrease in habitat suitability may have been greater if pre-construction cover types could have been delineated to the level of detail of post-construction cover types.

Table 2. Albeni Falls impact on breeding mallards.

Area	Pre-construction Acres	HSI	HU's	Post-construction Acres	HSI	HU's	Net impact (HU's)
Clark Fork Delta	3,940	0.66	2,600	2,619	0.50	1,310	-1,290
Denton Slough	974	0.72	701	266	0.44	117	-584
Hope Peninsula	179	0.32	57	179	0.32	57	0
Hope Islands	128	0.32	41	128	0.32	41	0
Ellisport Bay	205	0.89	182	165	0.50	82	-100
Trestle Creek	168	0.66	111	152	0.44	67	-44
Upper Pack River	1,068	0.89	951	992	0.50	496	-455
Lower Pack River	1,196	0.55	658	108	0.21	23	-635
Oden Bay	1,486	0.60	892	340	0.30	102	-790
Sandpoint Bay	735	0.66	485	419	0.36	151	-334
Bottle Bay	150	0.44	66	143	0.32	46	-20
Pend Oreille River	6,580	0.64	4,211	4,955	0.50	2,478	-1,733
Total	16,809		10,955	10,466		4,970	-5,985

Status and Management Goals. Chronic loss of mallard nesting habitat in Canada, and subsequent large reductions in production, have contributed to record low mallard populations nationwide. Breeding mallard populations in the intensively surveyed area of the United States and Canada have decreased from 8.7 million in the 1970's to 5.5 million as of 1985 (USFWS-CWS 1986). Likewise, blue-winged teal, canvasback, and northern pintail numbers have decreased nationwide. "Continuing habitat degradation and loss since the early 1960's have diminished the likelihood of these populations recovering to former abundance without innovative and intensive management on private and public lands, greater efforts to preserve existing habitat, and changes in land use and agricultural practices on private lands" (USFWS-CWS 1986). The midcontinent mallard and pintail populations are designated as an immediate international priority (USFWS-CWS 1986). The North American breeding population goal for mallards is 8.7 million ducks by the year 2000 (USFWS-CWS 1986). The pintail population is currently at 2.9 million, while the goal is 6.3 million (USFWS-CWS 1986). Bag limits on both mallards and pintails have been reduced for the upcoming 1988-89 hunting season.

Idaho's 1987-88 duck hunters bagged only 187,000 ducks, a record low number (Will 1988). This season marked the sixteenth year of a gradual decline in the duck harvest since 1971, when waterfowl hunters took nearly 700,000 ducks in Idaho (Will 1988). The number of mallards counted during the 1988 midwinter survey (90,000) was down 29.9% from 1987 and down 43.72 from the previous five-year average (Will et al. 1988). As a result, there is an important need to increase Idaho's resident duck populations by protecting and improving remaining wetland habitats.

IDFG statewide management goals for ducks include 1) increase Idaho's resident and wintering duck populations, and 2) increase waterfowl habitat in Idaho (Will et al. 1986).

A goal at the McArthur Lake WMA (located north of Pend Oreille Lake) is to increase duck production, and a goal at the Pend Oreille WMA is to maintain mallard production and waterfowl use. A goal at the Coeur d'Alene River WMA (located south of Pend Oreille Lake) is to increase production of ducks (IDFG 1986a). The Kalispel Tribe's goal for ducks is to protect existing feeding and reproductive habitat, and to improve conditions for mallards where they have been adversely affected (McLanahan, pers. commun.).

Canada Goose

Hydroelectric Impacts. Canada geese use a variety of nest sites, but prefer to nest on small islands (Will et al. 1986). They also use a wide variety of artificial nest structures placed on the ground, water, or elevated on posts and trees. Most geese nest within 200 yards of water on a site with good visibility (Will et al. 1986).

Most geese in Idaho hatch in May. Adequate brood-rearing habitat is important. It includes open water, gentle bank slopes, and short succulent grasses and forbs for foraging. If brood habitat is not available, adults will sometimes take the young several miles from the nest site. This can result in increased mortality of the young (Will et al. 1986).

A total of 4,699 breeding Canada goose HU's were estimated to have been lost in the study area (Table 3). There were two major impacts. One was the loss of wetland acreage in general. The second was reductions in brood-rearing habitat suitability in remaining habitat. The project is normally operated such that water levels are still rising through the fluctuation zone during May and June. This results in a situation where little or no vegetation is at the water's edge during a large part of goose brood-rearing.

Table 3. Albeni Falls impact on breeding Canada geese.

Area	Pre-construction Acres	HSI	HU's	Post-construction Acres	HSI	HU's	Net impact (HU's)
Clark Fork Delta	3,807	0.75	2,855	2,486	0.75	1,864	-991
Denton Slough	808	0.75	606	100	0.15	15	-591
Hope Peninsula	22	0.1	2	22	0.1	2	0
Hope Islands	128	0.3	38	128	0.3	38	0
Ellisport Bay	139	0.4	56	99	0.1	10	-46
Trestle Creek	42	0.4	17	26	0.05	1	-16
Upper Pack River	810	0.75	608	718	0.65	467	-141
Lower Pack River	1,134	0.75	850	38	0.1	4	'-846
Oden Bay	1,361	0.6	817	216	0.45	97	-720
Sandpoint Bay	434	0.6	260	118	0.2	24	-236
Bottle Bay	54	0.35	19	47	0.25	12	-7
Muskrat Lake	150	0.8	120	71	0.75	53	-67
Morton Slough	776	0.65	504	412	0.55	227	-277
Pend Oreille River (w/o Muskrat & Morton)	2,890	0.5	1,445	1,709	0.4	684	-761
Total	12,555		8,197	6,190		3,498	-4,699

Status and Management Goals. The Canada goose nests throughout Idaho with large numbers also migrating through. Two populations of Canada geese, the Rocky Mountain Population and the Pacific Population, are found in Idaho. The Pacific Population is largely non-migratory, with most populations wintering on or near their nesting areas (Will et al. 1986). The Albeni Falls Project area is included in the range of the Pacific population. IDFG statewide management goals for Canada geese include 1) increase Idaho's local and wintering Canada goose population, and 2) increase habitat in Idaho (Will et al. 1986).

IDFG management emphasis on improving habitat for resident Canada geese will continue (Will et al. 1986). "The emphasis will include improving nesting habitat by adding artificial nest structures wherever possible and by developing natural nest sites on state-owned WMA's where appropriate. The Department will also acquire permanent and reliable sources of food for Canada geese on all seasonal ranges. This will be

accomplished by cooperating with the USFWS in a variety of innovative programs which will include purchasing, leasing, cost-sharing with landowners, and other procedures" (Will et al. 1986).

A future program goal of the Department is to acquire additional land in the Clark Fork River Delta and Johnson Creek (IDFG 1986). In addition, conservation easements or acquisitions of land on Denton and Morton Sloughs and on Oden Bay, to protect waterfowl from intrusion by human development, will be investigated (IDFG 1986a).

Canada goose production is the number one use priority at the McArthur Lake WMA and the number two use priority at the Pend Oreille WMA. Both WMA's are in the vicinity of the Albeni Falls Project. The goals at both WMA's is to increase Canada goose production. The objective at McArthur Lake is to produce 350 geese to flight stage each year. About 200 geese were produced in 1986 and 100 geese were produced in 1985 (IDFG 1986b). The objective of 250 geese produced each year on the Pend Oreille WMA was met in 1986 (IDFG 1986b). A goal at the Coeur d'Alene River WMA is to increase production of Canada geese (IDFG 1986a).

The USFWS Region 1 goal for nesting Canada geese is to maintain population levels in the Columbia River drainage (USFWS 1980b). The breeding population of the Pacific Population of the Canada goose was estimated at 25,OO0 geese in 1984-85. The breeding population goal for the Pacific Population in the year 2000 is 29,000 geese (USFWS-CWS 1986). The Kalispel Tribe's goal for management of Canada geese is to increase populations and improve habitat (McLanahan, pers. commun.).

Redhead

Hydroelectric Impacts. Redheads spend the entire year on water, and do not require uplands to meet any of their life requisites (Howard and Kantrud 1983). Redhead food in freshwater wetlands consists of submerged vegetation including Chara spp. (G. Unland, pers. commun. in Howard and Kantrud 1983). Human disturbance is likely the main factor governing the distribution of wintering redheads in coastal lagoons and bays on the Gulf of Mexico (S. Cornelius pers. commun. in Howard and Kantrud 1983). Howard and Kantrud (1983) reported thatconstruction and use of waterways caused redheads to shift to less accessible areas in a lagoon.

The Albeni Falls Project caused losses of an estimated 3,379 wintering redhead HU's (Table 4). One project impact was that preferred feeding depths are closer to shore now than prior to the project. This is a function of water level operations that make the shallow areas closer to human disturbances on shore. This has reduced the habitat suitability for redheads, which are very sensitive to being disturbed while feeding (Howard and Kantrud 1983). There has also been a reduction of an estimated 655 acres of aquatic plant beds in the areas evaluated. Changed water level operations are suspected to have also caused a reduction of aquatic plant species richness (see "Habitat Changes" section). These impacts examined in Oden Bay, Sandpoint Bay, and the Pend Oreille River downstream to Dover may have occurred in additional areas in Pend Oreille Lake, although the examined areas are believed to have incurred the largest impacts.

Table 4. Albeni Falls impact on wintering redheads (Oden Bay, Sandpoint Bay, and Pend Oreille River to Dover).

	Pre-construction			Post-construction			Net impact
Area	Acres	HSI	HU's	Acres	HSI	HU's	(HU's)
Oden Bay	3,629	0.83	3,012	3,128	0.66	2,064	-948
Sandpoint Bay and Pend Oreille River to Dover	5,271	0.83	4,375	5,117	0.38	1,944	-2,431
Total	8,900		7,387	8,245		4,008	-3,379

Status and Management Goals. The redhead is a North American waterfowl species with both economic and ecological importance. It is highly desired by hunters (Howard and Kantrud 1983). Redhead numbers declined drastically in the early 1960's and it became illegal to kill them from 1960 to 1963 (Bellrose 1976). Strict bag limits were imposed after that and are still in place. Lake Pend Oreille provides winter habitat for about 20% of the Pacific Flyway redheads. About 98% of the redheads wintering in Idaho are found on or immediately adjacent to Pend Oreille Lake (IDFG 1986a). Wintering redhead counts fluctuate annually with the overall trend being fairly stable in Idaho, while the Pacific Flyway trend is declining (Figure 7). Little is known about their habitat requirements in Idaho or their migrations.

The IDFG plans to; (1) initiate a study during the 1986-1990 planning period, and/or cooperate with some other agency or a university in such a study, to gather information on the ecology and migration of redheads wintering in Idaho; (2) strive to protect the wintering habitat on Lake Pend Oreille; and (3) through the Pacific Flyway Council, cooperate with the USFWS and Canadian Wildlife Service (CWS) to manage this important redhead population (Will et al. 1986).

The North American goal for the breeding redhead duck population is 760,000 ducks in the year 2000 (USFWS-CWS 1986). This number is based on annual waterfowl surveys in Canada and the states of Wisconsin, Minnesota, Nebraska, Colorado, Wyoming, California, and Alaska. There is no specific Pacific Flyway goal for redheads at this time (USFWS, pers. commun.). The Kalispel Tribe's goal for ducks is to protect existing feeding and reproductive habitat (McLanahan, pers. commun.).

In addition to redheads, 10% to 50% of the wintering canvasback population in Idaho is found on Pend Oreille Lake (USFWS, unpubl. data). The current population level of canvasbacks is at 435,000; the North American goal is 580,000 (USFWS-CWS 1986). Canvasback hunting has been closed nationwide during the 1988-89 hunting season because numbers are low.

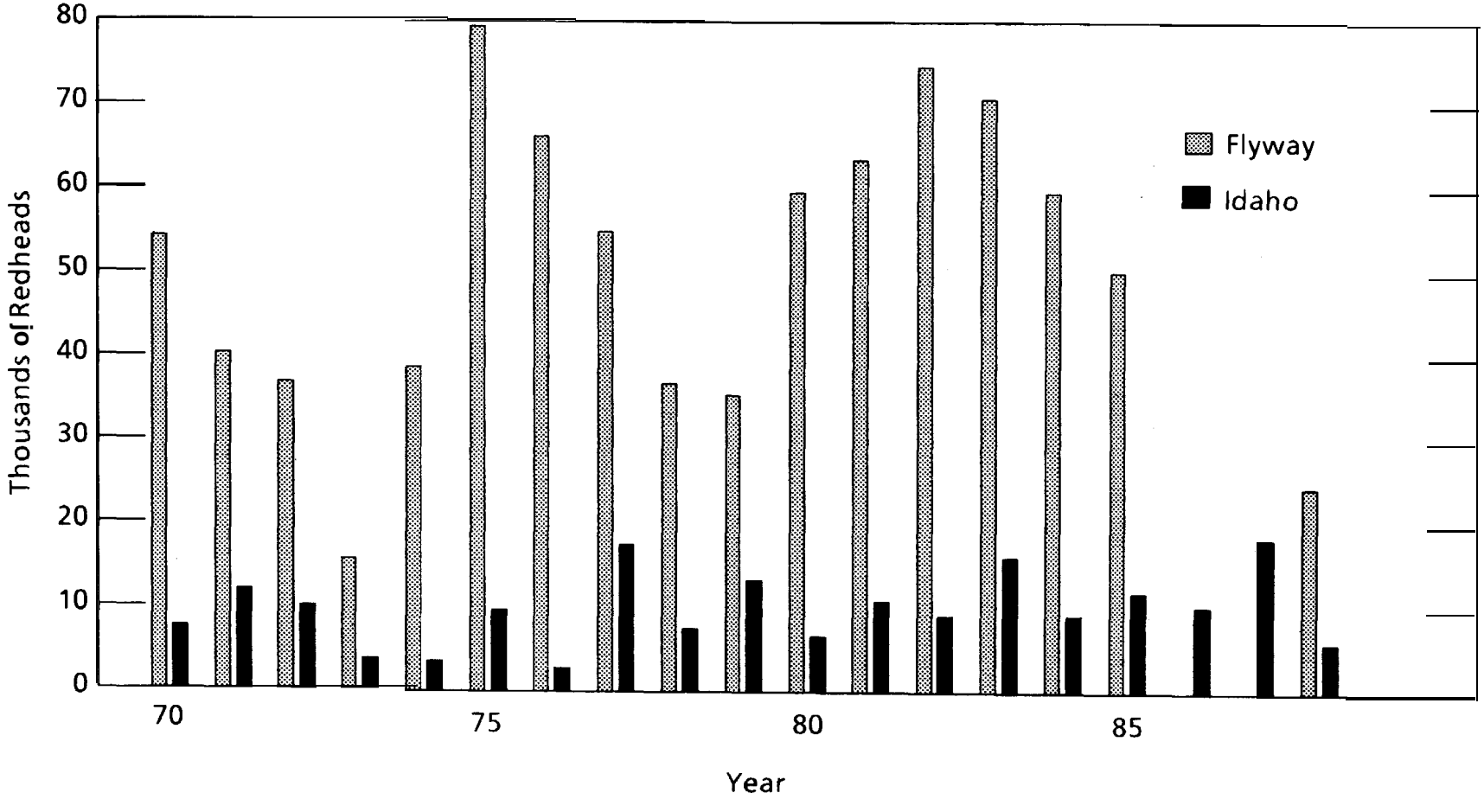


Fig 7. Midwinter redhead counts in Idaho and Pacific Flyway

Bald Eagle

Hydroelectric Impacts. Habitat loss is, and will probably continue to be, the most significant long-term threat to all bald eagle populations in the Pacific states recovery area (USFWS 1986). Forests with suitable nest and perch trees are critical for bald eagle populations (USFWS 1986). Bald eagle nests in the Pacific recovery area are usually located in uneven-aged stands with old-growth components (Anthony et al. 1982), and are near water bodies that support an adequate food supply. Nest tree species vary regionally. In Idaho, large cottonwoods, ponderosa pines, and Douglas firs are used (USFWS 1986).

The Albeni Falls Project caused losses of an estimated 4,508 HU's for breeding bald eagles (Table 5) and 4,365 HU's for wintering bald eagles (Table 6). Project impacts to bald eagles were evaluated in areas where extensive losses of forested wetlands occurred (Clark Fork and Pack River Deltas), and in the Pend Oreille River area, where moderate amounts of cottonwoods were lost and hydroelectric project operations have increased human use of the area. Bald eagles generally are not tolerant of human disturbance during the breeding season (USFWS 1986). Human activities have caused abandonment of nests, and led to reproductive failures (Detrich 1980 and Lehman 1983 in USFWS 1986). Eagle tolerance of human disturbance varies between individuals (USFWS 1986). Craighead and Craighead (1979) in Meyer (1979) found that eagles were disturbed mostly by: 1) people on foot, followed by 2) boat traffic, 3) stopping vehicles, and 4) moving vehicles. Meyer (1979) found a similar relationship between bald eagles and human disturbance in northern Idaho and northwestern Montana.

Adverse impacts in the Pend Oreille River area included a reduction in suitable nesting and perching habitat, and an increase in project-related human disturbance. This increased human disturbance has primarily resulted from water levels being held higher throughout the summer, increasing recreation use of the Pend Oreille River area. Within this area, the Corps of Engineers operates four recreation sites with boat launching facilities. It is felt this human disturbance impact is project-related, and is greater than the impact that would be occurring if the Albeni Falls Project did not exist.

Adverse impacts in the Clark Fork and Pack River Deltas were specifically related to loss of perching and nesting habitat. These losses occurred in areas that were previously the most protected from human disturbance.

Table 5. Albeni Falls impact on breeding bald eagles.

Area	Pre-construction Acres	HSI	HU's	Post-construction Acres	HSI	HU's	Net impact (HU's)
Clark Fork/Denton	4,615	0.97	4,477	2,586	0.86	2,224	-2,253
Upper Pack River	810	0.69	559	756	0.42	318	-241
Lower Pack River	1,134	0.79	896	0			-896
Pend Oreille River	4,181	0.43	1,798	2,192	0.31	680	-1,118
Total	10,740		7,730	5,534		3,222	-4,508

Table 6. Albeni Falls impact on wintering bald eagles.

Area	Pre-construction Acres	HSI	HU's	Post-construction Acres	HSI	HU's	Net impact (HU's)
Clark Fork/Denton	4,615	0.86	3,969	2,586	0.77	1,991	-1,978
Upper Pack River	810	0.83	672	756	0.63	476	-196
Lower Pack River	1,134	0.73	828	0	-		-828
Pend Oreille River	4,181	0.63	2,634	2,192	0.58	1,271	-1,363
Total	10,740		8,103	5,534		3,738	-4,365

Status and Management Goals. The historical status and distribution of bald eagle populations in the Albeni Falls Project area is not well understood. Between 1947 and 1970, reproduction in most bald eagle populations drastically declined (Broley 1958 and Sprunt et al. 1973 in USFWS 1986), and the species disappeared from much of its breeding range. Research indicated that certain organochlorine pesticides, primarily DDE, interfered with bald eagle productivity by causing excessive thinning of egg shells (Krantz et al. 1970 in USFWS 1986). Historical records provide evidence for the decline of bald eagles in the Pacific Northwest, although suspected declines are hard to quantify because intensive surveys were not conducted until the latter part of the twentieth century (USFWS 1986).

Recent work by Crenshaw (1988) has indicated an expanding breeding and wintering bald eagle population around Lake Pend Oreille. Peak numbers of 274 eagles were counted in the winter of 1985-86, and 429 eagles were counted in the winter of 1986-87. Totals of four active bald eagle nest sites and one inactive site were identified during the study. One additional known nest has been established in the Pend Oreille area since the study was completed.

Bald eagle reproduction throughout the species' range seems to have improved since registration of DDT and other organochlorine pesticides was canceled for most uses in the early 1970's (Postupalsky 1978 in USFWS 1986). The increase of eagles in the Lake Pend Oreille area seems consistent with a general trend of increasing eagle populations in the Northwest. The moderate increases in some breeding populations in the Pacific recovery area are probably associated with decreasing environmental levels of DDE (USFWS 1986).

Wintering bald eagles prey on spawned-out kokanee salmon and a variety of other fish species, waterfowl, and mammals at Lake Pend Oreille (Crenshaw 1988). Lake Pend Oreille supported the most popular kokanee salmon fishery in Idaho from the 1940's through the early 1970's (Bowles et al. 1987). Over one million kokanee were harvested annually from 1951 to 1965. Annual kokanee harvest has declined steadily since 1965, due to a number of cumulative factors (Bowles et al. 1987). Prior to 1967, Albeni Falls Project operations included an annual drawdown during the spawning period, which increased embryo mortality by exposing redds of lake shore spawning kokanee (Bowler et al. 1979). Cabinet Gorge Dam blocked an important kokanee spawning run into the Clark Fork River and tributaries. Declining kokanee abundance may have been accelerated by sport and commercial fishing (Bowles et al. 1987). The establishment of opossum shrimp (Mysis relicta) in Lake Pend Oreille, after their introduction in 1968 by the IDFG, adversely impacted kokanee recruitment (Bowles et al. 1987). In an effort to enhance Lake Pend Oreille kokanee production, the Cabinet Gorge Hatchery was constructed in a cooperative effort between BPA, IDFG, and Washington Water Power. Rebuilding the kokanee population to attain the goal of over 0.75 million harvested annually will depend on production from this hatchery (Bowles et al. 1987).

The bald eagle is presently federally listed as endangered in Idaho under the Endangered Species Act of 1973 (as amended). The primary objective of the Pacific Bald Eagle Recovery Plan (USFWS 1986) is to provide secure habitat for bald eagles in the seven-state Pacific recovery area and increase populations in specific geographic areas to levels where it is possible to delist the species. Delisting should occur on a regionwide basis. One criteria is that there should be a minimum of 800 pairs nesting in the seven states. Also, population recovery goals must be met in at least 80% of 37 management zones with nesting potential.

The northern Idaho panhandle region is included in Management Zone #7, which includes northeastern Washington. The recovery population goal in this management zone is the establishment of 69 breeding pairs, including target goals of two pairs in the Pend Oreille Lake/River Key Area and one pair in the Coeur d'Alene River Key Area (USFWS 1986). Although the recovery goal of two territories in the Pend Oreille Lake/River Key Area has been met, only 40 total pairs are established in the entire management zone. Because bald eagle territories are not yet established in many key areas, the establishment of additional territories in the Pend Oreille area may be necessary if Management Zone 7 recovery goals are to be met.

Idaho Fish and Game management for raptors will be directed at preserving their habitat, protecting and enhancing nest sites, and implementing the Bald Eagle Recovery Plan in Idaho, including nest site protection (Morache et al. 1985).

A goal of the Idaho Panhandle National Forest (USFS 1987) is to contribute to the conservation and recovery of the listed threatened and endangered species on the Forest. Bald eagle management will emphasize surveys and mapping of nesting, feeding, and roost sites, and protection of those identified use areas. The Kalispel Tribe's goals for bald eagle management are the same as those outlined in the Pacific Bald Eagle Recovery Plan (USFWS 1986); the main objective is to identify and protect nesting and roosting areas (McLanahan, pers. commun.).

Peregrine Falcon

Hydroelectric Impacts. The peregrine falcon is presently listed as endangered in the United States under the Endangered Species Act of 1973 (as amended). Severe population declines were identified in the early 1960's with peregrines essentially extirpated from the northern Rocky mountain states by 1975 (Heinrich et al. 1986). It has been suggested that the demise of the peregrine could be traced to a loss of habitat (wetlands and associated prey base), which resulted in part from changes in precipitation levels and hydroelectric development (Nelson pers. commun., in Burnham and Howard 1986). The widespread use of DDT and its metabolites, which prevented reproduction from occurring, also contributed significantly to the decline of peregrines (USFWS 1984).

Peregrines in the Rocky Mountains nest mainly on mountain cliffs and river gorges. Peregrines may travel up to 17 miles from nesting cliffs to hunting areas (Porter and White 1973). Habitats such as river bottoms, marshes, meadows, and lakes attract numerous small birds and provide preferred hunting areas for peregrines. Although some reservoirs provide migratory and wintering habitat for birds, hydroelectric development has caused a net loss of quality breeding habitat for birds in the form of riparian plant communities. At the Albeni Falls Project alone, over 6,600 acres of forested and herbaceous wetlands and associated peregrine prey populations have been lost. Because so many factors have affected peregrines, specific impacts from the loss of wetland vegetation are unquantified.

At least one historic peregrine falcon eyrie has been confirmed near Clark Fork (Kilpatrick, unpubl. rept.). Approximately 20 years ago, peregrines were observed on several occasions near cliffs in the Clark Fork Delta area (K. English, pers. commun. in Kilpatrick unpubl. rept.).

Status and Management Goals. The peregrine falcon is presently listed as endangered in the United States under the Endangered Species Act of 1973 (as amended). Under the American Peregrine Falcon Recovery Plan (USFWS 1984), the statewide recovery objective for Idaho is 17 pairs.

Because peregrine falcons have reached such low numbers in the northern Rocky Mountain states, it takes more than just improved habitat to recover the population. A large scale captive propagation and release program for peregrines has been under way since 1970. Release locations that offer the greatest biological potential are used.

Peregrine falcon management on the Idaho Panhandle Forest will focus on survey and inventory of suitable habitat for reintroduction and verification of reported presence (USFS 1987).

Kilpatrick (unpubl. rept.) surveyed the Sandpoint Ranger District and listed nine suitable cliff habitats for breeding habitat. Ten areas were identified that represented characteristics of suitable reintroduction (hack) sites.

The IDFG will attempt to re-establish extirpated native species to portions of their former range (Morache et all 1985). The Department will continue to cooperate with USFWS, BLM, USFS, private industry, and the Peregrine Fund in programs to reintroduce breeding peregrines into suitable locations in Idaho.

Black-capped Chickadee (Forested Wetlands)

Hydroelectric Impacts. Black-capped chickadees generally prefer deciduous or riparian woodlands (Larrison and Sonnenberg 1968, Sturman 1968). Cadwallader (1980) found that black-capped chickadees were associated with riparian zones on the South Fork of the Boise River in southern Idaho. Chickadees are "insect gleaners" and serve as important insect predators in forested areas (Sturman 1968).

Black-capped chickadees are cavity nesters (Stauffer and Best 1980). Nesting habitat is often limited by the number of available snags (Schroeder 1983). Preferred nesting tree species include willows (*Salix* spp.) and cottonwoods and poplars (*Populus* spp.).

A total of 2,286 black-capped chickadee HU's were estimated to have been lost in the study area as a result of the Albeni Falls Project (Table 7). Forested wetlands were lost in the Clark Fork Delta (1,699 acres), Pack River Delta (533 acres), and along the Pend Oreille River (82 acres).

Field sampling and mapwork resulted in high HSI's because the cottonwood-dominated wetlands in the area were and are fairly dense and medium to older aged. Some existing cottonwood stands are younger-aged than most pre-construction stands, causing the slightly lower HSI for post-construction conditions. Measured habitat variables related directly to habitat needs of a wide variety of wildlife species associated with forested wetlands.

Table 7. Albeni Falls impact on forested wetland species (represented by black-capped chickadee).

Area	Pre-construction			Post-construction			Net impact
	Acres	HSI	HU's	Acres	HSI	HU's	(HU's)
Deciduous forested wetlands in study area	3,221	0.98	3,157	907	0.96	871	-2,286

Status and Management Goals. The black-capped chickadee is closely associated with riparian habitat. Therefore, most management goals that pertain to riparian areas in Idaho affect black-capped chickadees. The IDFG will place special emphasis on the preservation and protection of riparian habitats. This will include: (1) fencing to exclude livestock, (2) support of legislation to compensate private landowners who preserve riparian habitats, and (3) purchasing or acquiring easements to key riparian habitats. The Department will promote any reasonable efforts to rehabilitate damaged riparian habitats. It will further identify riparian zones used by any nongame species classified as Threatened or Endangered, and Sensitive Species, or a Species of Special Concern and make every reasonable effort to preserve and enhance areas, whether through purchase, rehabilitation, fencing, or other means (Morache et al. 1985).

In response to past and continuing losses of forested and scrub-shrub wetlands, the USFWS has identified these areas as unique and scarce on a regional basis (Sather-Blair, pers. commun.). The mitigation goal for these riparian wetlands as defined in the USFWS's mitigation policy is no net loss of in-kind habitat values (Sather-Blair, pers. commun.). The protection and enhancement of riparian wetlands is also consistent with the goals of the Migratory Bird Treaty Act, the Emergency Wetland Protection Act of 1987, and the executive Order 11990 (Sather-Blair, pers, commun.).

Riparian areas on the Idaho Panhandle National Forest will be managed to feature dependent resources (includes wildlife communities) while producing other resource outputs at levels compatible for the objective for dependent resources (USFS 1987). The Kalispel Tribe is aware of the critical nature of riparian habitat, and will make every effort to enhance such areas where possible (McLanahan, pers. commun.).

Yellow Warbler (Scrub-shrub Wetlands)

Hydroelectric Impacts. The yellow warbler breeds throughout most of the United States and is a common breeder in scrub-shrub habitat in Idaho. Preferred nesting habitats for this insectivorous warbler are generally wet areas with abundant shrubs or small trees (Schroeder 1982). Areas of extensive forest with closed canopies are generally avoided (Hebard 1961) while areas of low deciduous growth are preferred (Morse 1973). A breeding bird census across the United States (VanVelzen 1981) was summarized to determine nesting habitat needs of the yellow warbler (Schroeder 1982). Approximately 67% of all censused areas dominated by shrubs were used, while 100% of all shrub wetlands received use. Wetland shrub habitats also had the highest average breeding densities of yellow warblers. In Idaho, yellow warblers also occupy areas dominated by deciduous shrubs or narrow streamside thickets (Larrison et al. 1967).

A total of 71 HU's were estimated to have been gained in the study area (Table 8). Acreage increases were measured in the Pack River Delta (73 acres), Clark Fork Delta (22 acres), and along the Pend Oreille River (6 acres). A loss of 28 acres was measured in Sandpoint Bay: Field sampling and mapwork resulted in high HSI's for yellow warblers because the willow-dominated wetlands are dense, tall, and primarily composed of hydrophytes. The habitat variables measured related directly to habitat needs of a variety of forested wetland dependent species.

Table 8. Albeni Falls impact on scrub-shrub wetland species (represented by yellow warbler).

Area	Pre-construction			Post-construction			Net impact
	Acres	HSI	HU's	Acres	HSI	HU's	(HU's)
Deciduous scrub-shrub wet lands in study area	361	0.97	350	434	0.97	421	+71

Status and Management Goals. Similar to the black-capped chickadee, the future distribution of the yellow warbler is closely tied to riparian area management goals in Idaho. IDFG, USFWS, and USFS riparian goals for nongame species are listed under "management goals" for the black-capped chickadee. The Kalispel Tribe's management goals for scrub-shrub wetlands are similar to those for forested wetlands (McLanahan, pers. commun.).

White-tailed Deer

Hydroelectric Impacts. White-tailed deer habitat in Idaho is dominated by dense coniferous forests interspersed with natural brushfields, logged areas, river bottoms, and farm lands. Northern Idaho whitetails subsist almost entirely on a diet of browse during the winter (Pengelly 1961 in Jageman 1984). In the best whitetail habitat, the major limiting factor on population growth seems to be the severity of the winter (Hanna and Meske 1986). During the coldest months and deep snow conditions, deer select habitats for cover value and eat whatever is available in these habitats. As winter progresses, deer make more use of coniferous browse, especially Douglas fir and western red cedar (Jageman 1984).

The USFWS (1960) reported that about 4,000 acres of white-tailed deer range were eliminated as a result of the Albeni Falls Project. This present impact assessment was limited to effects on whitetail winter habitat only, because it was felt this was the most significant impact on whitetails. An estimated 1,680 wintering whitetail HU's were lost in the study area (Table 9).

Under pre- and post-construction conditions, habitat suitability was found to be high. The major impact of the project on wintering whitetails was the loss of 2,240 acres of forested wetlands in the lowland areas. Jageman (1984) reported that during winter, whitetails are usually located at lower elevations in association with river bottoms and lake shores. Lowland forests that were lost contained western red cedar, a very important winter forage species (Pengelly 1961, Jageman 1984). The whitetail model indicated the limiting factor in the study area is availability of winter forage. Furthermore, the lost habitat was the lowest elevation winter range available, and probably provided the shallowest snow depths in the general area.

Table 9. Albeni Falls impact on wintering white-tailed deer.

	Pre-construction			Post-construction			Net impact
Area	Acres	HSI	HU's	Acres	HSI	HU's	(HU's)
Deciduous scrub-shrub and forested wetlands in study area	3,582	0.75	2,686	1,341	0.75	1,006	-1,680

Status and Management Goals. White-tailed deer were abundant in northern Idaho in the early 1800's (Hanna and Meske 1985). By the early 1900's, populations were low after being exploited for food by trappers, miners, and settlers. Populations probably peaked in the late 1940's and early 1950's. after several decades of protection. Whitetail populations have declined since then (Hanna and Meske 1985), due to development from human population growth. Although whitetail numbers are still large, they were historically more widespread in Idaho. The annual harvest of white-tailed deer in the northern Idaho panhandle has increased steadily since 1974 (IDFG 1986). Though population data are difficult to collect, the general consensus among sportsmen and Department field personnel is that whitetail populations have increased in the panhandle of northern Idaho during the 1980's (IDFG 1986).

IDFG statewide white-tailed deer goals include: 1) maintain the white-tailed deer population that occurs in northern Idaho at current levels, and 2) increase harvest and recreational hunting opportunity in the major white-tailed deer management units (Hanna and Meske 1985).

Albeni Falls Project lands are located in IDFG white-tailed deer management Area 1 (hunting units 1, 2, 3, 4A, 5, 6, 8, 8A, lO(west), lOA, llA, 15, and 16). This area contained 79% of the statewide harvest in 1984. The goal in Area 1 is to maintain white-tailed deer populations, increase harvest, and provide more recreational opportunity.

The number one priority use on the Farragut WMA (located near the southern tip of Pend Oreille Lake) is white-tailed deer winter range management (IDFG 1986). The Kalispel Tribe's goal for white-tailed deer management is to maintain habitat available for them (McLanahan, pers. commun.).

Muskrat

Hydroelectric Impacts. Muskrats are found throughout Idaho except in high mountain areas. They live in ponds, streams, and other waterways, where they feed primarily on aquatic vegetation (Toweill et al. 1985). Muskrats reach their greatest densities in aquatic habitats that provide dense emergent vegetation and that are bordered by terrestrial herbaceous vegetation (Errington 1963 in Allen and Hoffman 1984). Muskrats build lodges from the dominant emergent plants available in the vicinity of the lodge site. Lodges provide nesting sites for waterfowl. Muskrats are more abundant in lakes having stable water levels than in lakes with fluctuating water levels (Bellrose and Brown 1941 in Allen and Hoffman 1984). Low water levels result in reduced food and cover availability (Errington 1939 in Allen and Hoffman 1984) and increased freezing in the winter. High water results in altered vegetation composition and forces muskrats out of lodge and burrow sites (Allen and Hoffman 1984). Water depth between 0.46 meters (18 inches) and 1.2 meters (4 feet) is most suitable for muskrats (Errington 1963 in Allen and Hoffman 1984).

It was estimated that muskrats lost 1,756 HU's in the study area (Table 10). Muskrats were evaluated only in open water slough/riverine areas and deep-water marshes. These were the areas that were assumed to provide sufficient open water to overwinter muskrats. Reduced HSI's found in emergent wetlands were a result of a reduction in the percentage of emergent herbaceous vegetation consisting of cattail and bulrush, the preferred foods of muskrats. The reduced HSI's found in slough areas were a result of the loss of vegetation within the fluctuation zone. As a result, food availability near open water has been diminished.

Table 10. Albeni Falls impact on muskrats.

Area	Pre-construction Acres	HSI	HU's	Post-construction Acres	HSI	HU's	Net impact (HU's)
Clark Fork/Denton	1,260	0.60	756	1,412	0.29	409	-347
Ellisport Bay	61	0.62	38	21	0.53	11	-27
Trestle Creek	23	0.62	14	7	0.53	4	-10
Pack River	200	0.65	130	112	0.41	46	-84
Oden Bay	24	0.56	13	24	0.25	6	-7
Bottle Bay	9	0.62	6	2	0.53	1	-5
Sandpoint Bay	185	0.61	113	39	0.30	12	-102
Pend Oreille River	6,591	0.41	2,702	6,109	0.25	1,527	-1,175
Total	8,353		3,772	7,726		2,016	-1,756

Status and Management Goals. The muskrat is the most important furbearer in Idaho in terms of the total number of animals harvested (over 124,000 were trapped in the 1983-84 trapping season). Muskrat pelts made up 39% ($322,000) of the total value of all pelts harvested that season. Muskrats are an important component of the marsh ecosystem, serving as a food source for several predators and acting as a modifier of wetland vegetation (Allen and Hoffman 1984).

Muskrats are being managed to attain high densities at both the McArthur Lake and Coeur d'Alene River WMA's (IDFG 1986), as part of waterfowl management on these areas. The IDFG statewide goal for muskrats is to maintain annual trapping seasons for muskrats and encourage muskrat populations, where desirable, for fish and wildlife benefits (Toweill et al. 1985). The Kalispel Tribe's goal is to maintain available muskrat habitat (McLanahan, pers. commun.).

Effects of Hydroelectric Impacts on Wildlife

Wildlife is important to people in Idaho and the nation, from both a consumptive and nonconsumptive point of view. The economic value of hunting to the State of Idaho is estimated at over $177,000,000 annually. It was recently estimated that nonconsumptive wildlife users and watchers in Wyoming spend at least $678,000,000 annually (Idaho Falls Post-Register, March 27, 1988).

Nationwide, large acreages of wetlands continue to be lost and/or impacted annually, from man's activities. More than 70% of riparian ecosystems have been altered. In some western states, riparian losses have been as high as 95% (Brinson et al. 1981). Riparian wetland areas represent less than 0.5% of the total land surface in Idaho, yet acre for acre, they are the most important areas for fish and wildlife. They support a rich diversity of wildlife species. In western Montana, 59% of the species of land birds use riparian habitats for breeding, and 36% only breed in riparian habitats (Mosconi and Hutto 1982 in Cooperrider et al. 1986). In the Great Basin of southeast Oregon, 299 of 363 species of land vertebrates either directly depend on riparian habitats or utilize them more than any other cover type (Thomas et al. 1979). More and more land in northern Idaho is rapidly being subdivided and developed, and remaining wetlands and riparian areas are being impacted. Riparian areas are also being destroyed because cottonwood is now in high demand to create wafer board, a substitute for plywood. Whereas the loss of one or two wetlands may not seem significant, the cumulative loss of wetlands through time has impacted many wildlife species.

Development and operation of the Albeni Falls Project resulted in the loss of over 6,600 acres of wetland vegetation. In addition, wetlands are eroding annually, along the perimeter of the lake, due to changes in natural water levels and vegetative cover, and heavy wave action against denuded shores. The problem is exacerbated by upstream dams, which impede sediment transport to the Clark Fork Delta.

The Albeni Falls Project has resulted in quantified losses of bald eagle, mallard, Canada goose, redhead, black-capped chickadee (deciduous forested wetlands), and muskrat habitat units. Losses of thes'e target species represent losses of hundreds of other wildlife species.

It is generally agreed that habitat quality is correlated with densities of animals. Hence, development and operation of the Albeni Falls Project caused a reduction in potential numbers of bald eagles, mallards, Canada geese, redheads, black-capped chickadees, and muskrats that can be supported by habitat in the Pend Oreille Lake area.

The Albeni Falls Project has extensively affected the environment around Pend Oreille Lake, and the opportunity to observe a variety of wetland wildlife species. Areas that once were productive wetlands for wildlife are now mudflats. A former resident of the Pend Oreille Lake area recalled the pre-project days of premium muskrat trapping and abundant waterfowl in marshes that are now mudflats.

As the USFWS (1960) pointed out, ". ..the Albeni Falls Project resulted in larger wildlife losses than were estimated in the reports of 1947 and 1953." With the 1980 Northwest Power Act, society is recognizing the -impacts that hydroelectric development and operation have had on wildlife and the importance of mitigating for losses.

MITIGATION PLAN

Mitigation Goals

The goal of this mitigation plan is to provide benefits equal to the target species' Habitat Units lost due to the development and operation of the Albeni Falls Facility, through a combination of protection/enhancement projects, preferably in the Pend Oreille River drainage. As per agreement between the Idaho Department of Fish and Game and the Bonneville Power Administration (Project No. 87-43), the interagency work group has made a strong effort to propose mitigation actions (projects) that will address the needs of wildlife and benefit the greatest number of target species. However, as large multi-species projects are developed, it becomes apparent that some target species will gain more HU's than were originally lost, and some target species will gain fewer HU's than were lost. With this knowledge, the interagency work group agreed that some tradeoffs between extra benefits to some target species and fewer benefits to other target species would have to occur within the overall mitigation plan, in order to meet contractual agreements, and to provide for the needs of wildlife in the area. Furthermore, this methodology provides the most cost-effective means of mitigation.

Mitigation Proposals

The following preferred mitigation proposals were designed by the interagency work group, which used the wildlife impact assessment as a guideline, while considering the needs of wildlife in the area. The following proposals to mitigate past hydroelectric impacts are presented in order of priorities chosen by the interagency work group.

It is the interagency work group's understanding that should future circumstances dictate that all or part of a preferred mitigation project is not feasible, then alternative projects would be added to the mitigation plan until the loss of the preferred project (in terms of target species' HU's) would be compensated for.

Clark Fork Delta area. Protect and enhance 1,800 acres in the Clark Fork Delta area. Protection will require obtaining conservation easements or fee-titles from willing sellers. Most of the proposal area is under flowage easement with the USACE. Under the existing easement, landowners retain the right to many activities (logging, burning, grazing, etc.) that potentially threaten high quality wildlife habitat in the area.

Proposed enhancements include improving two dikes and installing five water control structures to stabilize water levels over 160 acres, re-establishing native aquatic plants in two subimpoundments, planting 200 acres of cottonwoods, installing 100 goose nesting platforms, and building about four miles of fence.

Annual operation and maintenance will include maintaining fences, goose nesting structures, dikes, and water control structures; possibly replanting native plants: managing grazing to benefit wildlife: controlling weeds ; and managing the marshlands for an optimum balance of open water and vegetation.

Benefits: Acquiring full management rights, and subsequently managing this area for wildlife, will benefit numerous wetland-associated species. The area is a unique wetland complex comprised of the Clark Fork River, numerous channels, islands, forested wetlands, scrub-shrub wetlands, and deep-water and shallow-water marshes. Species closely tied to cottonwood forests, including the bald eagle, will benefit by existing habitat being protected from logging, and by cottonwood acreages being increased. All species dependent on shallow-'and deep-water marshes, including waterfowl and aquatic furbearers, will benefit from stabilized water levels and increased emergent vegetation in the diked areas. Controlling and managing grazing and installing goose nesting platforms will further improve nesting and brood-rearing habitat for ducks and Canada geese. This project will help alleviate problems associated with losses of wetlands, and it complements agency and tribal goals outlined in the "Target species impacts, status, and management goals" section.

Target Species	HU's
Mallard	1,020
Canada goose	1,380
Bald eagle - breeding	1,280
Bald eagle - wintering	1,250
Black-capped chickadee	850
Yellow warbler	120
White-tailed deer	810
Muskrat	350
Total	7,060

Costs: Advance design will include identifying willing sellers, preparing a management plan, conducting contour surveys, and other engineering and project design. Implementation includes costs of appraisals, acquiring easements or fee-titles, and enhancements to

initially develop the project area. Annual operation, maintenance, and monitoring will be necessary to achieve and sustain the estimated benefits to wildlife.

Advance Design	85,000
Implementation	1,027,000
Total	1,112,000
Operation and Maintenance	17,000
Monitoring	8,000
Annual Costs for Life of Albeni Falls Project	25,000

Pack River area. Protect and enhance 1,300 acres along the Pack River upstream from Pend Oreille Lake. Protection will require obtaining easements or fee-titles from willing sellers. Much of the area is being grazed or farmed, and the cottonwood forested areas are threatened by logging.

Proposed enhancements include planting 100 acres of cottonwoods, installing 100 goose nesting platforms, and building about four miles of fence.

Annual operation and maintenance will include maintaining fences and goose nesting platforms, managing grazing to benefit wildlife, controlling weeds,, replanting cottonwoods if necessary, and planting waterfowl food crops.

Benefits: Acquiring full management rights, and subsequently managing this area for wildlife, will protect and enhance wetlands along about 20 miles of meandering riverine habitat. The area is a mosaic of river channel, oxbows, wetlands, and associated upland nesting habitat for ducks. Controlling and managing grazing will improve duck nesting and brood-rearing cover and Canada goose brood pasture. Installing goose platforms will greatly enhance nesting success. Protecting and expanding cottonwood forests along the Pack river will benefit black-capped chickadees, white-tailed deer, and a variety of other species, including wintering bald eagles. This project will help alleviate problems associated with losses of wetlands, and it complements agency and tribal goals outlined in the "Target species impacts, status, and management goals" section.

Target Species	HU's
Mallard	2,040
Canada goose	710
Bald eagle - wintering	230
Black-capped chickadee	550
Yellow warbler	210
White-tailed deer	660
Muskrat	120
Total	4,520

Costs: Advance design will include identifying willing sellers and preparing a management plan. Implementation includes costs of appraisals, acquiring easements or fee-titles, and initial enhancements. Annual operation, maintenance, and monitoring will be necessary to achieve and sustain the estimated benefits to wildlife.

Advance Design	55,000
Implementation	1,035,000
Total	1,090,000
Operation and Maintenance	14,000
Monitoring	5,000
Annual Costs for Life of Albeni Falls Project	19,000

Pend Oreille River area. Protect and enhance 809 acres along the shore of the Pend Oreille River, adjacent to the Kalispel Indian Reservation in Washington. Presently, the areas are threatened by marshland draining, logging, and hawthorn eradication. Protection will require obtaining easements or fee-titles from willing sellers. The areas proposed for acquisition contain several stands of mature cottonwoods in an area frequented by breeding and wintering bald eagles. After enhancement, the areas will also provide high-quality nesting and brood-rearing waterfowl habitat.

Proposed enhancements include installing 100 goose platforms, fencing for grazing control, planting cottonwoods and willows, fertilizing and interseeding with native grasses, deepening and stabilizing water levels in a 1.5 mile long stream, and creating and maintaining openings in marshlands. Annual operation and maintenance will include fence maintenance, goose platform upkeep, weed control, fertilizing, and maintenance of water control structures.

Benefits: Fencing of a 150 foot corridor along the 1.5 mile long stream, and fencing of a 90 acre stand of cottonwoods and willows, along with water stabilization and plantings, will benefit a variety of riparian-dependent wildlife species. Improved streamside cover and forage, in conjunction with goose platforms and pasture, will benefit nesting and brood-rearing waterfowl. Protection and expansion of cottonwood stands along the Pend Oreille River will benefit breeding and wintering bald eagles and cavity nesters. Controlling grazing and logging will create and/or maintain travel corridors and habitat for deer, elk, and possibly black bear. Creating and maintaining openings in marshlands, along with other marsh manipulations, will enhance habitat diversity and benefit aquatic furbearers, waterfowl, and many other species. This project will help alleviate problems associated with losses of wetlands, and it complements agency and tribal goals outlined in the "Target species impacts, status, and management goals" section.

Target Species	HU's
Mallard	230
Canada goose	450
Bald eagle - breeding	72.0
Bald eagle - wintering	720
Black-capped chickadee	100
Yellow warbler	70
White-tailed deer	160
Muskrat	40
Total	2,490

Costs: Advance design will include engineering studies and development of a management plan. Implementation includes costs of title insurance, appraisals, surveys, acquisition, and enhancements necessary to protect and initially develop the areas. Annual operation, maintenance, and monitoring will be necessary to achieve and sustain the estimated benefits to wildlife.

Advance Design	27,000
Implementation	724,000
Total	751,000
Operation and Maintenance	14,000
Monitoring	19,000
Annual Costs for Life of Albeni Falls Project	33,000

Pend Oreille Lake (6 subimpoundments). Enhance Pend Oreille Lake by creating subimpoundments, preferably in the Cocolalla Creek, Little Mallard Bay, Lower Muskrat Lake, Denton Slough, Swan Bay, and Riley Creek areas. The purpose of this project is to stabilize water levels throughout the year, create islands, and increase the growth of emergent vegetation in the subimpoundments created by the construction of dikes and water control structures. This project will enhance about 868 acres in the Pend Oreille Lake/River area. About 597 acres of wetlands are currently under flowage easements with the USACE. Additional easements or land use agreements will be acquired in these areas. About 188 acres of uplands and wetlands not under flowage easements will be protected through acquisition of fee-titles or easements. Gap-dikes will be constructed across the mouths of Denton Slough and Swan Bay to allow boat passage at summer water levels.

Enhancements in the subimpoundments will include island construction, goose nesting platform construction, native aquatic plant establishment, fencing, goose pasture management, and upland nesting cover management for waterfowl. Development of all projects will be coordinated with fishery management personnel.

Benefits: Implementation of this project will stabilize water levels and increase emergent vegetation in areas that currently are devoid of emergent vegetation, due to large seasonal fluctuations in water levels in the lake and river. Stable water levels and native aquatic plant establishment will increase the diversity of cover types in the area, and benefit aquatic furbearers. Increased upland cover and increased growth of emergents in shallow water areas will benefit mallards and other waterfowl during early nesting and brood rearing season. Enhancements such as nest platform construction and pasture management will provide secure areas for nesting Canada geese and their broods. The creation of subimpoundments in the Pend Oreille Lake area complements existing management goals of land management agencies and tribes, and helps lessen a serious problem to wildlife, due to the continued loss of wetlands in Idaho and nationwide.

Target Species	HU's
Mallard	540
Canada goose	480
Black-capped chickadee	40
Yellow warbler	20
White-tailed deer	60
Muskrat	300
Total	1,440

Costs: Advance design planning will include costs of conducting surveys, soliciting bids and quotes, and preparing management plans. Implementation will involve costs of fee-title acquisitions or easements on 188 acres of land not currently under Corps ownership, costs of land use agreements or additional easements on 597 acres of wetlands currently under a flowage easement with the Corps, construction of five dikes, 15 islands, 20 goose nesting platforms, five water control structures (two to allow boat passage during summer

water level), aquatic vegetation planting, channelizing three peninsulas to create islands, and fencing. Annual operation, maintenance, and monitoring will be necessary to sustain the wildlife benefits of the project.

Advance Design	100,000
Implementation	909,000
Total	1,009,000
Operation and Maintenance	20,000
Monitoring	4,000
Annual Costs for Life of Albeni Falls Project	24,000

Spirit Lake area. Protect and enhance about 186 acres of wetlands and 60 acres of uplands in the upper Spirit Lake area, through acquisition of fee-titles or easements from willing sellers. The upper end of the project area would be diked with a water control structure in order to seasonally flood existing pasture lands. Potholes will be blasted in the seasonally flooded wetland to benefit nesting waterfowl. About 20 acres will be managed for goose pasture.

Benefits: This project area contains extensive herbaceous, forested, and scrub-shrub wetlands. Easements or fee-title acquisition will protect existing wetlands, which are threatened by surrounding development. Dike construction and pothole blasting will increase the diversity of cover types in the project area, and benefit a variety of waterfowl, aquatic furbearers, big game and nongame wetland species. This project complements existing management goals and objectives of land management agencies and tribes, and will help alleviate problems associated with losses of wetlands in Idaho.

Target Species	HU's
Mallard	200
Canada goose	100
Black-capped chickadee	20
Yellow warbler	30
White-tailed deer	40
Muskrat	60
Total	450

Costs: Advance design will include costs of identifying willing sellers, conducting surveys, soliciting bids and quotes, and preparing a management plan. Implementation will involve costs of fee-title acquisitions or easements on 246 acres, dike and water control structures, pothole blasting, fencing, and goose nesting platforms. Annual operation, maintenance, and monitoring will be necessary to sustain wildlife benefits of the project.

Advance Design	20,000
Implementation	269,000
Total	289,000
Operation and Maintenance	6,000
Monitoring	2,000
Annual Costs for Life of Albeni Falls Project	8,000

Hoo'doo Creek/Lake area. Protect and enhance 2,130 acres of private land in the 'Hoodoo Creek area, including the Beaver Lake/Lambertson Lake area, through acquisition of fee-titles or easements from willing sellers. In addition, enhance Hoodoo Lake (about 80 acres) and associated wetlands by dredging deeper water areas, creating islands, and constructing a water-regulating dam at the outlet of the lake.

The Hoodoo Creek and Beaver/Lambertson Lakes area is characterized by numerous emergent wetlands and scattered scrub-shrub and deciduous forested wetlands. Much of the area is currently heavily grazed by cattle. Enhancements planned on the protected acreage includes numerous small dikes and water control structures to stabilize water levels and create more permanent marsh areas, goose nesting platforms, fencing, goose pasture management, and 100 acres of cottonwood plantings.

Benefits: Protection and/or enhancement of 2,210 acres of wetland and associated upland habitats in the Hoodoo Creek and Beaver/Lambertson Lakes area will benefit a variety of wetland wildlife species. Remova1 of grazing will lead to increased nesting cover for waterfowl. More open water areas and habitat diversity will result from dredging Hoodoo Lake. Dike construction and water level control will stimulate the growth of emergent vegetation and provide brood cover for mallards and other waterfowl. Cottonwood plantings will benefit black-capped chickadees and a variety of other riparian dependent species. This project will help alleviate problems associated with losses of wetlands, and it complements agency and tribal goals outlined in the "Target species impacts, status, and management goals" section.

Target Species	HU's
Mallard	1,630
Canada goose	950
Black-capped chickadee	220
Yellow warbler	100
White-tailed deer	510
Muskrat	470
Total	3,880

Costs: Advance design will include costs associated with identifying willing sellers, conducting surveys, soliciting bids and quotes, and preparing management plans. Implementation will involve costs of fee-title acquisitions or easements on 2,130 acres, dredging, island and dike construction, water control structures, goose nesting platforms, planting materials, and fencing. Annual operation, maintenance, and monitoring will be necessary to sustain the wildlife benefits of the project.

Advance Design	100,000
Implementation	1,414,000
Total	1,514,000
Operation and Maintenance	30,000
Monitoring	5,000
Annual Costs for Life of Albeni Falls Project	35,000

Oden Bay redhead protection. Protect key redhead wintering habitat in Oden Bay by acquiring easements or fee-titles from willing sellers. Acquisition of 240 acres (110 acres grassland and 130 acres mudflat/open water) would protect wintering redheads from future residential development in the bay. Redheads are very sensitive to human disturbance near feeding areas (Howard and Kantrud 1983), and Oden Bay is threatened by further residential development.

Canada geese would benefit from fencing and managing a portion of the grassland for goose pasture, and erecting about 20 platforms. On the remainder of the grassland, mallard nesting habitat would be improved as a result of vegetation response to protection from grazing.

Benefits: Protecting Oden Bay from future development will benefit redheads on about 3,000 acres of key winter habitat. The redhead is a species of high management concern. Presently, Oden Bay supports about 98% of Idaho's wintering redheads, and about 20% of the Pacific Flyway population. Management of the acquired 110 acres of grassland will benefit nesting waterfowl. This project will help alleviate problems associated with losses of wetlands, and it complements agency and tribal goals outlined in the "Target species impacts, status, and management goals" section.

Target Species	HU's
Mallard	20
Canada goose	70
Redhead	1,170
Bald eagle - breeding	150
Bald eagle - wintering	80
Total	1,490

Costs: Advance design will include identifying willing sellers and preparing a management plan. Implementation includes costs of appraisals, easements or fee-titles, and 20 goose nesting platforms. Annual operation, maintenance, and monitoring will be necessary to sustain the estimated benefits to wildlife.

Advance Design	10,000
Implementation	1,671,000
Total	1,681,000
Operation and Maintenance	2,000
Monitoring	2,000
Annual Costs for Life of Albeni Falls Project	4,000

Pend Oreille redhead projects. The goal for redhead mitigation is to protect and/or enhance wintering redheads at least to the extent of hydropower-caused losses. There were an estimated 3,380 HU's lost as a result of hydroelectric development and operation. The Oden Bay proposal is estimated to provide 1,170 wintering redhead HU's. Thus, the goal of this proposal (in addition to the Oden Bay proposal) is to provide benefits of at least 2,210 wintering redhead HU's.

Due to a shortage of data on Pend Oreille Lake wintering redheads and aquatic plants, the work group could not propose specific mitigation measures. To propose additional mitigation measures (besides protection of Oden Bay) investigations are needed for at least three topics:

1) Wintering redhead distribution, relative abundance, and feeding behavior.

2) Aquatic plant distribution and abundance.

3) Methods of increasing quality and quantity of wintering redhead habitat.

Benefits: Investigations and subsequent mitigation actions will greatly benefit wintering redheads on Pend Oreille Lake. The area supports about 98% of the redheads wintering in Idaho and about 20% of the Pacific Flyway wintering redheads. The redhead is a species of high management concern, and investigations and mitigation are needed to effectively protect and enhance wintering habitat on Pend Oreille Lake. This project would complement agency and tribal goals for redheads.

Target Species	HU's
Redhead	2,210

Costs: An aquatic plant inventory could be conducted in about one year. A redhead habitat use evaluation will require a minimum of two to three winters, and depending on weather might require four or more winters. Examination of methods to improve habitat suitability could be conducted concurrently with the redhead and aquatic plant studies. Costs of the above investigations are estimated to be $60,000. Additional advance design costs and costs of implementation, operation, maintenance, and monitoring will depend on the results of the investigations and subsequent mitigation actions.

Westmond Lake area. Protect 130 acres in the Westmond Lake area through fee-title acquisition or easement. This acreage includes about 90 acres of wetlands and 40 acres of adjacent uplands. A water control structure will be constructed at the outlet. In addition, eight goose nesting platforms will be constructed.

Benefits: Fee-title acquisition or easements, and fencing, will protect this high-quality habitat for waterfowl and aquatic furbearers. Because the wetlands and adjacent uplands are threatened by future development, protection of the area at this time will benefit mallards, Canada geese, muskrats, and a variety of other wetland-associated wildlife species. The wetland is located close to a road, and provides many wildlife viewing opportunities for the public. This project will help alleviate problems associated with losses of wetlands, and it complements agency and tribal goals outlined in the "Target species impacts, status, and management goals" section.

Target Species	HU's
Mallard	140
Canada goose	80
Muskrat	60
Total	280

Costs: Advance design planning will include costs associated with identifying willing sellers, conducting surveys, soliciting bids and quotes, and preparing a management plan. Implementation will include the costs of fee-title acquisitions or easements on 130 acres, one water control structure, goose nesting platforms, and fencing materials. Annual operation, maintenance, and monitoring will be necessary to sustain wildlife benefits of the project.

Advance Design	15,000
Implementation	110,000
Total	125,000
Operation and Maintenance	2,000
Monitoring	2,000
Annual Costs for Life of Albeni Falls Project	4,000

Peregrine,reintroductions. The goal of this project is to annually release three to five peregrine falcons from each of three hack (reintroduction) sites for at least ten years. After ten years of releases, success of the project will be evaluated to assess whether further releases are needed. Kilpatrick (unpubl. rept.) surveyed the Sandpoint Ranger District of the Idaho Panhandle National Forests in 1987 and concluded that there are numerous suitable cliffs on Lake Pend Oreille, Clark Fork Delta, and the Clark Fork River valley for peregrines to use as breeding habitat.

The exact locations of the hack sites will be determined in the future, based on habitat suitability, proximity to other release sites, and other biological factors. The exact location of the site may vary annually, based on returning falcons, predators (i.e. great horned owls), success of previous releases, etc. The goal of this project is to return more peregrines to the wild and ultimately help reach the statewide Idaho recovery objective of 17 nesting pairs.

Costs: Advance design will include annual hack site selection, great horned owl surveys, and preparation of management plans. Implementation costs for ten years of releases are estimated to be' $17,000 per site per year, and include the propagation and release of birds. Operation and maintenance will be necessary as long as releases are made. Monitoring costs include annual surveys to locate active nests and signs of productivity, and an evaluation of the release site and methods.

Advance Design	10,000
Implementation	510,000
Total	520,000
Operation and Maintenance	3,000
Monitoring	4,000
Annual Costs for Ten Years	7,000

Pend Oreille Lake goose enhancement. There are a total of 3,780 acres of Corps project lands licensed to the IDFG for wildlife management. However , most of the lands are inundated by Albeni Falls Reservoir at summer pool levels. There are 513 acres above water during spring and summer and available for IDFG management (IDFG 1986a:43). This proposal is to enhance goose nesting and brood-rearing on these licensed lands above normal high pool. These lands would be enhanced for geese by installing and maintaining new goose nesting platforms, maintaining existing platforms, and managing goose pasture.

Benefits: Canada goose nesting success will be improved by providing nesting platforms on these licensed lands. Brood-rearing will be enhanced by providing optimum pasture conditions. This project will help alleviate problems associated with losses of wetlands, and it complements agency and tribal goals outlined in the "Target species impacts, status, and management goals" section.

Target Species	HU's
Canada goose	60

Costs: Advance design will include preparing a management plan. Implementation will include costs of installing 50 platforms and building about two miles of fence. Annual operation and maintenance will include maintaining brood pasture and about 200 platforms. Nesting platform condition, goose nesting success, and brood pasture conditions will need to be monitored.

Advance Des ign	10,000
Implementation	13,000
Total	23,000
Operation and Maintenance	8,000
Monitoring	3,000
Annual Costs for Life of Albeni Falls Project	11,000

Bal'd eagle projects. Protect 780 acres of bald eagle habitat near Pend Oreille Lake by acquiring fee-titles or easements from willing sellers. This action is designed to preserve four existing nests and two perennially important wintering areas. All areas are in private ownership and potentially threatened by residential development, logging, and other human disturbances.

The nest portion of this proposal is to: 1) eliminate nesting disturbance in the "nest site area," and 2) maintain or enhance nest site habitat suitability. Nest site area is defined as the area within a quarter mile radius of the occupied nest and each alternate nest in the territory (Figure 8) (Montana Bald Eagle Working Group 1986:25). For the purpose of this proposal, nest site area was estimated for each nest that needs protection (Colby nest, 200 acres: Springy Point, Sheepherder Point, and Eaton Lake nests, 160 acres).

The two wintering areas proposed for protection are Granite Creek (60 acres) and Warren Island (40 acres). The mouth of Granite Creek provides important winter hunting perches, and the general area is used as a nocturnal roost site. Warren Island's western end provides another traditional nocturnal roost site. This conifer-covered ridge needs to be protected from human encroachment for this site to continue providing optimal roosting habitat.

All six areas need management to ensure optimum conditions for bald eagles. Fencing is needed to restrict human and livestock disturbance. Tree-topping, nest site structural improvements, and other treatments are needed to keep nests, nest site areas, perch trees, and roost areas suitable for eagles.

Benefits: The Springy Point, Sheepherder Point, and Warren Island areas are predominantly evergreen forest. The Colby, Granite Creek, and Eaton Lake areas have evergreen forested habitat, but also contain forested wetlands and herbaceous wetlands. Thus, in addition to helping maintain bald eagle production and roosting conditions in the Pend Oreille Lake area, protection and enhancement of these six areas will benefit a variety of wetland-dependent species and many other species. This action complements the Pacific Bald Eagle Recovery Plan and Crenshaw's (1988) recommendations for bald eagle management at Pend Oreille Lake.

Target Species	HU's
Mallard	140
Canada goose	110
Bald eagle - breeding	570
Bald eagle - wintering	500
Black-capped chickadee	50
Yellow warbler	10
White-tailed deer	90
Muskrat	70
Total	1,540

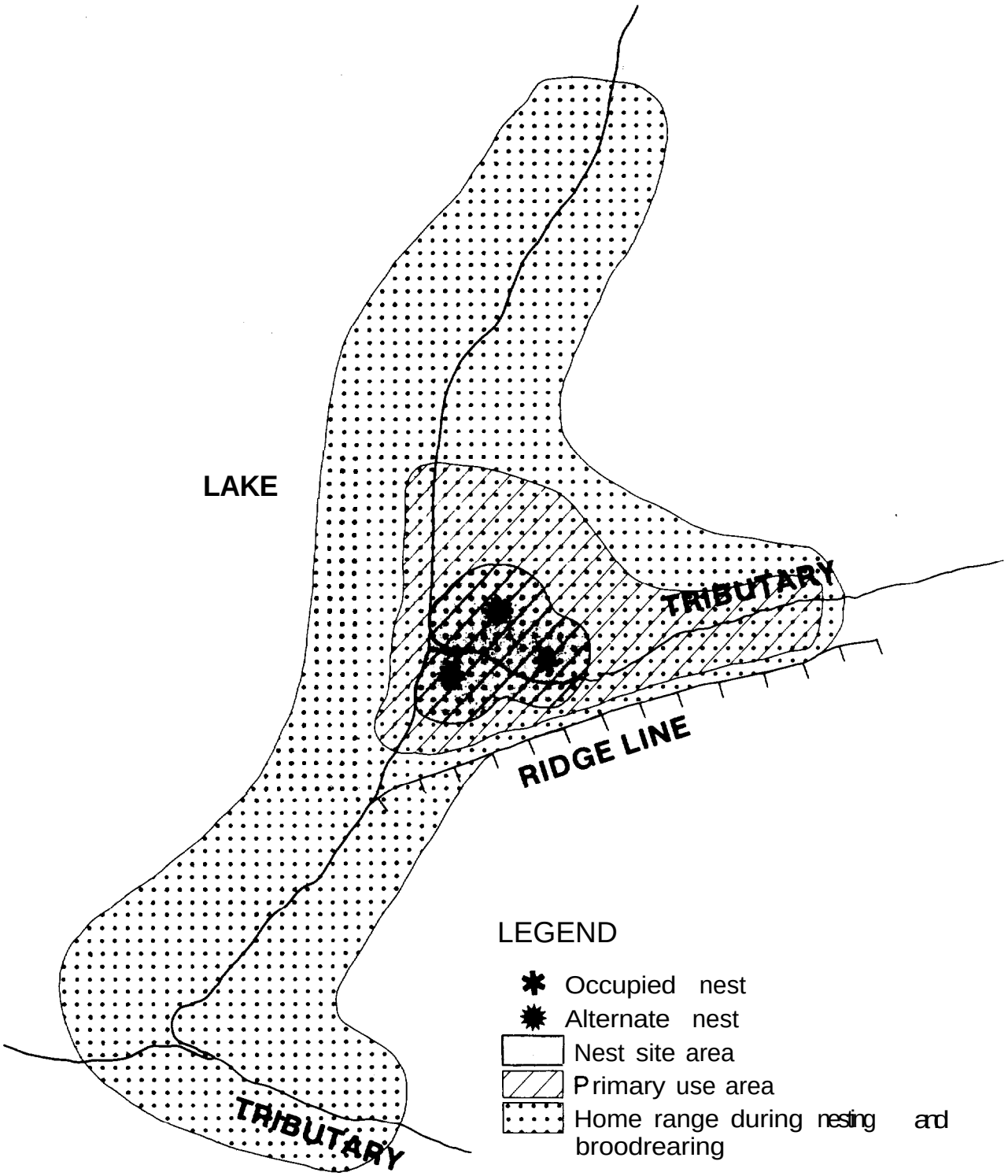


FIG.8. Example of a nest site area within the home range of a breeding bald eagle pair (from Montana Bald Eagle Working Group 1986).

Costs: Advance design will include identifying willing sellers and preparing a management plan. Implementation will include costs of obtaining appraisals, acquiring fee-titles or easements, improving nest structures, and constructing five miles of fence. Operation, maintenance, and monitoring will be necessary to sustain the benefits to wildlife.

Advance Design	30,000
Implementation	990,000
Total	1,020,000
Operation and Maintenance	10,000
Monitoring	3,000
Annual Costs for Life of Albeni Falls Project	13,000

Boundary Creek area. Protect about 55 acres by acquiring a fee-title or easement if the seller is willing. This parcel is in Idaho, and adjacent to the Creston Valley Wildlife Management Area in Canada. The area is predominantly a cottonwood forested wetland. It presently provides suitable nesting and wintering bald eagle habitat, and is suspected to be within the nesting home range of a pair of eagles. This parcel will be enhanced by fencing to restrict human disturbance and improve duck nesting habitat, and by tree-topping and nest construction to facilitate bald eagle nesting and perching.

Benefits: Protecting this area from human disturbance, logging, and development will preserve a large stand of cottonwoods, benefiting bald eagles and numerous other species associated with forested wetlands. This project will help alleviate problems associated with losses of wetlands, and it complements agency and tribal goals outlined in the "Target species impacts, status, and management goals" section.

Target Species	HU's
Mallard	30
Bald eagle - breeding	50
Bald eagle - wintering	50
Black-capped chickadee	40
White-tailed deer	40
Total	210

Costs: Advance design will include identifying if the seller is willing and preparing a management plan. Implementation will include costs of obtaining an appraisal, acquiring a fee-title or easement, constructing one half mile of fence, and improving nesting and perching conditions. Operation, maintenance, and monitoring will be necessary to sustain the benefits to wildlife.

Advance Design	10,000
Implementation	68,000
Total	78,000
Operation and Maintenance	3,000
Monitoring	2,000
Annual Costs for Life of Albeni Falls Project	5,000

Algoma Lake area. Protect 90 acres in the Algoma Lake area through fee-title acquisition or easement. This includes about 56 acres of wetlands and 34 acres of adjacent uplands. The area is currently threatened with the future development of a golf course. Enhancements will include island construction and native aquatic plant seeding.

Benefits: Acquisition of fee-titles or easements will protect this existing waterfowl and aquatic furbearer habitat from future development. Island construction and native aquatic plant seeding will increase habitat diversity in the area. This project will help alleviate problems associated with losses of wetlands, and it complements agency and tribal goals outlined in the "Target species impacts, status, and management goals" section.

Target Species	HU's
Mallard	60
Canada goose	40
Muskrat	20
Total	120

Costs: Advance design planning will include costs associated with identifying willing sellers, conducting surveys, soliciting bids and quotes, and preparing a management plan. Implementation will involve costs of fee-title acquisitions or easements on 90 acres, creating an island from an existing peninsula, fencing, and native aquatic plant seeding. Annual operation, maintenance, and monitoring will be necessary to sustain wildlife benefits of the project.

Advance Design	20,000
Implementation	91,000
Total	111,000
Operation and Maintenance	2,000
Monitoring	2,000
Annual Costs for Life of Albeni Falls Project	4,000

Twin Lakes area. Protect and enhance about 362 acres of wetlands and 100 acres of uplands in the upper Twin Lakes area, through acquisition of fee-titles or easements from willing sellers. Dikes with water control structures will be constructed in seasonally flooded wetlands to create areas with more permanent water. About 20 acres of the seasonally flooded wetlands will be managed for goose pasture. About 20 goose nesting platforms will be constructed in the area. The area will be fenced to create better nesting conditions for waterfowl.

Benefits: Protection and enhancement of this diverse wetland area will benefit a variety of waterfowl, aquatic furbearers, and nongame wetland species. Dike construction and water level control will stimulate the growth of emergents and provide brood cover for mallards and other waterfowl. Fencing will increase nesting cover for mallards, and is expected to increase the amount of scrub-shrub in the area. This will benefit yellow warblers and a variety of other wildlife. This project will help alleviate problems associated with losses of wetlands, and it complements agency and tribal goals outlined in the "Target species impacts, status, and management goals" section.

Target Species	HU's
Mallard	430
Canada goose	250
Black-capped chickadee	10
Yellow warbler	40
Muskrat	170
Total	900

Costs: Advance design planning includes costs of identifying willing sellers, conducting surveys, preparing a management plan, and soliciting bids and quotes. Implementation includes costs of easements or fee-title acquisition, appraisals, legal fees, dike and water control construction (approximately three 1,000 foot dikes and water control structures), and goose nesting platform and fence construction. Annual operation, maintenance, and monitoring will be necessary to sustain annual wildlife benefits.

Advance Design	20,000
Implementation	466,000
Total	486,000
Operation and Maintenance	6,000
Monitoring	2,000
Annual Costs for Life of Albeni Falls Project	8,000

Coeur d'Alene River area. Protect and enhance about 460 acres of wetlands and 30 acres of uplands in the lower Coeur d'Alene River area, by acquiring fee-titles or easements from willing sellers. A series of dikes and water control structures will be constructed in seasonally flooded wetlands to create areas of more permanent water. The area will be fenced to promote better nesting and brood rearing habitat for waterfowl. Approximately 40 acres of seasonally flooded wetlands will be managed for goose pasture. About 80 acres of cottonwood forests and 20 acres of willows (scrub-shrub) will be planted on seasonally flooded wetlands, increasing the existing acreage of these cover types. A total of 20 goose nesting platfornis will be constructed.

Benefits: Protection and enhancement of about 490 acres of wetlands and uplands in the lower Coeur d'Alene River area will benefit a variety of wetland wildlife species. Dike construction and water level control will increase emergent vegetation and increase habitat values for mallards, muskrats, and other wetland wildlife species. Goose platform installation will provide safe nest sites that might otherwise flood from high water common during most nesting seasons. Protecting existing cottonwood stands and planting additional acreages to cottonwoods will benefit wintering bald eagles by providing perch and roost sites. Black-capped chickadees and other riparian species will also benefit. This project will complement the Pacific Bald Eagle Recovery Plan Zone 7 goal of having one nesting pair of bald eagles established in the Coeur d'Alene River area. This project will also complement the IDFG goal of acquiring remaining critical parcels of land (wetlands) within the Coeur d'Alene WMA boundary.

Target Species	HU's
Mallard	400
Canada goose	280
Bald eagle - breeding	360
Bald eagle - wintering	420
Black-capped chickadee	110
Yellow warbler	60
White-tailed deer	170
Muskrat	140
Total	1.940

Costs: Advance design planning includes costs of identifying willing sellers, conducting surveys, preparing management plans, and soliciting bids and quotes. Implementation includes the costs of easements for fee-title acquisition, appraisals, legal fees, dike and water control construction (two 2,000-foot dikes and water control structures), goose platforms and fence construction, and cottonwood and willow plantings. Annual operation, maintenance, and monitoring will be necessary to sustain annual wildlife benefits.

Advance Design	30,000
Implementation	582,000
Total	612,000
Operation and Maintenance	8,000
Monitoring	2,000
Annual Costs for Life of Albeni Falls Project	10,000

Proposals to Reduce Ongoing and Future Hydroelectric Impacts

The following projects are proposed by the interagency work group to mitigate ongoing and future project-related habitat losses. The work group estimated that about 30 acres of wetlands are being lost annually to erosion and sloughing (see impact assessment section). It is possible these losses will continue for many decades, until erodible areas like the Clark Fork Delta and Priest River islands are entirely gone.

Clark Fork Delta breakwater. The interagency work group estimated ongoing project-related losses of 15 acres of wetlands annually in the delta. This is occurring for several reasons. The Clark Fork alluvium, composed of fine decomposed granitic soil, is very susceptible to erosion. The delta faces west, and is subjected to heavy wind-caused wave action. These conditions have not changed since construction of Albeni Falls Dam. However, project water levels are now held at normal high pool throughout the growing season, rather than the pre-project natural condition of flood flows quickly receding from wetlands. This has caused the loss of shoreline-stabilizing vegetation, exposed the erodible soils, and resulted in constant undercutting and subsequent sloughing of shoreline vegetation. The problem is exacerbated by upstream dams, which impede sediment transport to the delta.

This mitigation proposal is to construct a lO,OOO-foot breakwater across most of the Clark Fork Delta. Presently, the Corps is planning a 1,500 foot breakwater in the northern delta to protect their driftyard operation area from further wave-caused erosion and damage. Constructing an additional 10,000 feet of breakwater will reduce wave-caused erosion in the remainder of the delta.

Benefits: The breakwater will reduce ongoing and future project-related wetland losses, which will continue to occur if no action is taken. This proposal is to help protect habitat from future losses, so Habitat Unit benefits to wildlife were not estimated or credited as mitigation for past losses. The wetlands to be protected provide high-quality habitat for bald eagles, waterfowl, and a wide variety of other species associated with wetlands. This project will help alleviate problems associated with losses of wetlands, and it complements agency and tribal goals outlined in the "Target species impacts, status, and management goals" section.

Costs: Advance design will include engineering studies and preparation of a management plan. Implementation will include construction of 10,000 feet of breakwater: the cost estimate is based on preliminary , costs estimated by the Corps for their 1,500-foot breakwater ($300,000 for 1,500 feet). Due to the complex nature and magnitude of this project, cost estimates are very rough. Engineering studies are needed.

Advance Design	100,000
Implementation	2,000,000
Total	2,100,000
Operation and Maintenance	20,000
Monitoring	2,000
Annual Costs for Life of Albeni Falls Project	22,000

Priest River Islands protection. Several islands, located on the Pend Oreille River at the mouth of Priest River, continue to be eroded as a result of the Albeni Falls Project. Erosion continues to occur because project water level operations have caused the loss of shoreline stabilizing vegetation. At normal high pool, there are about 20 acres of islands. At lower water levels, the area subject to erosion totals about 90 acres. About one mile of shoreline needs protection from wave action. Possible methods to reduce erosion include riprapping, sandbagging, levee construction, or a combination of methods. Without erosion control, the islands will eventually be lost.

Benefits: Protecting these island wetlands will preserve this high-quality goose nesting area, and benefit a variety of other wetland-dependent species. This proposal is to help protect important island habitat from future losses, so predicted benefits to wildlife were not credited as mitigation for past losses. This project will help alleviate problems associated with losses of wetlands, and it complements agency and tribal goals outlined in the "Target species impacts, status, and management goals" section.

Costs: Advance design will include engineering studies and preparation of a management plan. Implementation will include costs of installing structures and/or materials to reduce erosion. Operation, maintenance, and monitoring will be necessary to continue erosion abatement at this site.

Advance Design	25,000
Implementation	100,000
Total	125,000
Operation and Maintenance	5,000
Monitoring	1,000
Annual Costs for Life of Albeni Falls Project	6,000

Mitigation Plan Summary

The Albeni Falls hydroelectric project was completed in 1955. With construction of the dam immediately downstream from Pend Oreille Lake, water levels on the lake have been artificially maintained at a higher level throughout the summer, rather than natural pre-construction conditions, when high spring flood waters receded quickly from the fluctuation zone during the June to July growing season. Prolonged high water levels have choked out vegetation and changed 4,376 acres of herbaceous wetlands and 2,314 acres of deciduous forested wetlands into 6,617 acres of open water and/or mudflats and 73 acres of scrub-shrub wetlands (see Table 1). An ongoing project-related loss is the erosion of shorelines with subsequent sloughing and loss of wetland vegetation.

The loss of important herbaceous and deciduous forested wetlands has resulted directly in the loss of wildlife. Using target wildlife species to represent impacts to other wildlife species, it was determined that development and operation of the Albeni Falls Project resulted in the losses of 5,985 mallard Habitat Units, 4,699 Canada goose HU's, 3,379 wintering redhead HU's, 4,508 breeding bald eagle HU's, 4,365 wintering bald eagle HU's, 2,286 black-capped chickadee (forested wetlands) HU's 1,680 white-tailed deer HU's, and 1,756 muskrat HU's (Table 11). The yellow warbler (scrub-shrub wetlands) gained 71 HU's. One Habitat Unit is equal to one acre of prime habitat for an individual target species.

The Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Public Law 96-501) directs that measures be implemented to protect, mitigate, and enhance fish and wildlife to the extent affected by development and operation of hydropower projects on the Columbia River system. Under direction of this Act, the interagency work group has developed a mitigation plan (Figure 9, Table 12), which follows mitigation goals developed at the beginning of this planning process. Through a series of protection and enhancement actions, implementation of this mitigation plan will provide benefits of an estimated 28,590 target species HU's (Table 13). This total is comprised of benefits to mallards, Canada geese, wintering redheads, breeding bald eagles, wintering bald eagles, black-capped chickadees, yellow warblers, white-tailed deer, and muskrats. Implementing this plan will also benefit peregrine falcons and the hundreds of other wildlife species represented by the above target species. All whitetail benefits in this mitigation plan are incidental to other species benefits, because no projects are designed specifically for whitetails. The initial cost of the mitigation plan is estimated to be $12,646,000., and annual. operation, maintenance, and monitoring costs for the life of the Albeni Falls Project are estimated to be $238,000. (Table 14). Proposals have been prioritized by the interagency work group based on mitigation goals and needs of wildlife in the area. Two projects have been proposed to alleviate ongoing losses of wildlife habitat from erosion.

Projects complement management policies and goals of federal and state wildlife agencies and the Kalispel Tribe. The protection and enhancement of riparian wetlands is consistent with goals of the Migratory Bird Treaty Act, the Emergency Wetland Protection Act of

1987, and Executive Order 11990 (Sather-Blair, pers. commun.). The mitigation plan will help alleviate serious problems associated with waterfowl and wetland losses across North America, and it will protect and enhance important wildlife populations in the Pend Oreille River drainage.

To our knowledge, all proposed acquisitions of easements or fee-titles in this plan meet the land acquisition criteria outlined in the Columbia River Basin Fish and Wildlife Program and the Northwest Power Act. Proposals were developed by wildlife biologists who took into consideration the needs of wildlife in the area, the cost-effectiveness of acquisition projects compared to available alternatives, and the biological objectives of the mitigation plan. The work group agreed that opportunities for enhancement of existing public land in the vicinity of northern Idaho were limited by the extreme scarcity of wetlands on public land. To our knowledge, funding of these mitigation projects with the BPA fund is not in lieu of any other expenditures presently authorized or required from other entities under other agreements or provisions of law.

Annual operation, maintenance, and monitoring of mitigation projects will be necessary for the life of the Albeni Falls Facility for this Plan to protect, **mitigate,** and enhance wildlife to the extent affected by hydroelectric development and operation. Continued annual funding is justified by the fact that as long as the facility is in place, the identified wildlife habitat impacts will continue to occur. The hydroelectric facility inundated naturally self-perpetuating ecosystems. A portion of this Plan is to mitigate those losses through man-made enhancements. With the methods used in this plan, mitigation credit for enhancement is the difference between the habitat values presently provided and the increased habitat values provided with hands-on management (habitat treatments followed by operation, maintenance, and monitoring). If annual operation, maintenance, and monitoring of enhancement actions cease being funded, the mitigation projects would no longer provide the full benefits estimated in this Plan. As a result, benefits of mitigation projects would have to be re-evaluated, and more acquisitions of fee-titles or easements would be needed to mitigate wildlife losses to the extent affected by hydropower. Annual operation, maintenance, and monitoring activities help ensure that the ratepayers' investments in wildlife in Idaho is spent wisely and effectively. The interagency work group looks forward to continued coordination with the Northwest Power Planning Council and the Bonneville Power Administration.

Table 11. Summary of Albeni Falls wildlife habitat impacts (Habitat Units).[1]

Target species	Pre-construction (HU's)	Post-construction (HU's)	Net impact (HU's)
Mallard	10,955	4,970	-5,985
Canada goose	8,197	3,498	-4,699
Redhead[2]	7,387	4,008	-3,379
Bald eagle - breeding	7,730	3,222	-4,508
Bald eagle - wintering	8,103	3,738	-4,365
Peregrine falcon	Lost 6,617 acres of riparian habitat		
Black-capped chickadee (forested wetlands)	3,157	871	-2,286
Yellow warbler (scrub-shrub wetlands)	350	421	+71
White-tailed deer[3]	2,686	1,006	-1,680
Muskrat[4]	3,772	2,016	-1,756

1 Cover type acreage changes are presented in Table 1.
2 Impacts quantified only in Oden Bay, Sandpoint Bay, and Pend Oreille River downstream to Dover.
3 Impacts quantified only for winter habitat.
4 Impacts quantified only for year-round habitat.

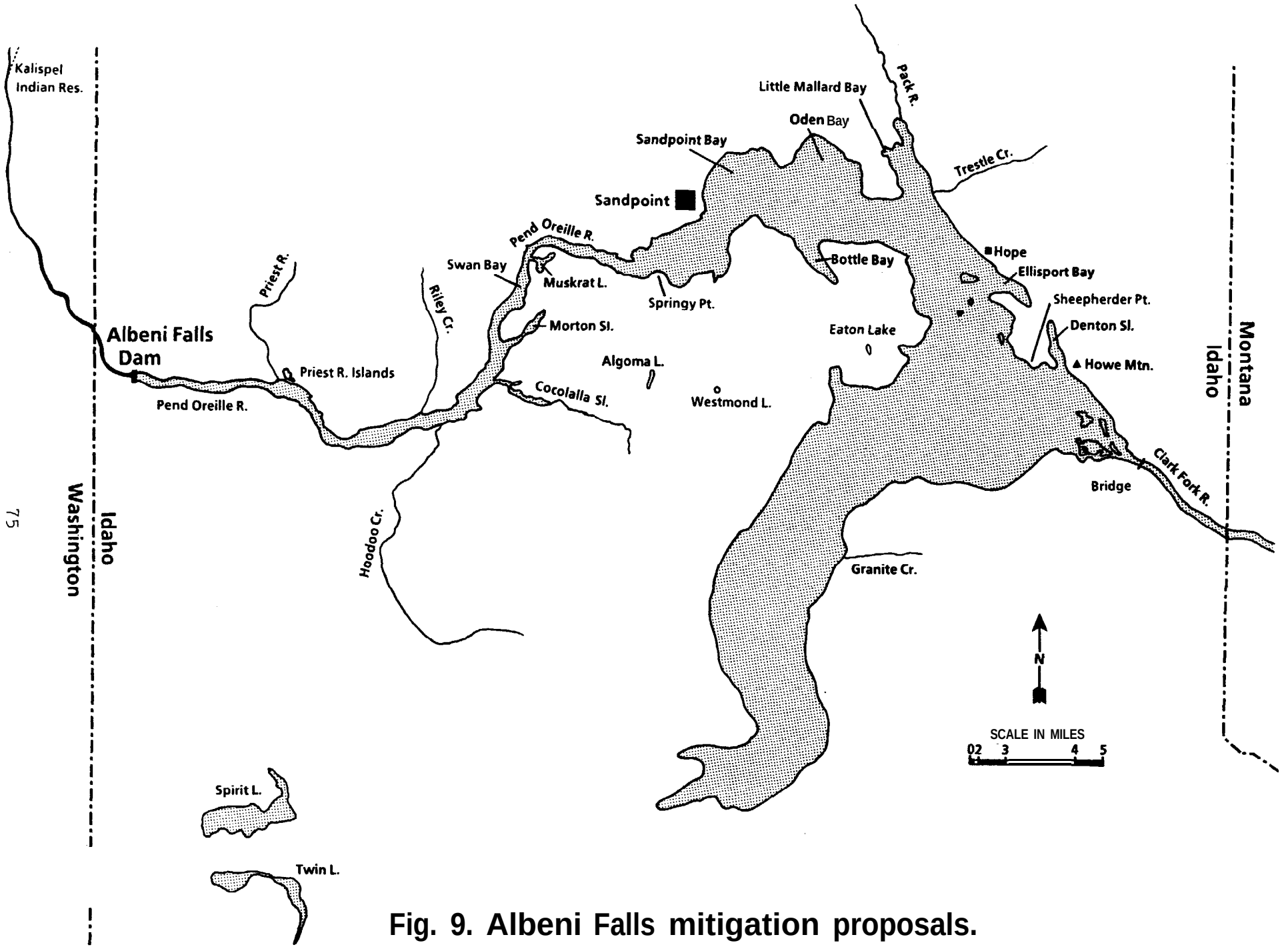


Fig. 9. Albeni Falls mitigation proposals.

Table 12. Albeni Falls Hydroelectric Facility proposed amendment to the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program.

Target Species	Habitat Losses Attributable to Hydropower	Mitigation Goals
All	Ongoing and future losses from erosion.	Reduce wetland losses that are occurring annually from erosion by constructing a breakwater across most of the west side of the Clark Fork Delta, and protecting islands at the mouth of the Priest River. Years 1 to 5, advance design. Years 1 to 10, implementation. Years 2 through life of Albeni Falls project, annual operation, maintenance, and monitoring.
Mallard	5,985 HU's	Provide benefits of 6,860 mallard HU's, 4,890 Canada goose HU's, 2,980 breeding bald eagle HU's, 3,170 wintering bald eagle HU's, 1,990 black-capped chickadee HU's, 660 yellow warbler HU's, 2,540 white-tailed deer HU's, and 1,800 muskrat HU's. To achieve these benefits, protect and enhance 8,000 acres of habitat, preferably in the following areas: Clark Fork Delta, Pack River, Pend Oreille River, Spirit Lake, Hoodoo Creek, Westmond Lake, Granite Creek, Springy Point, Sheepherder Point, Eaton Lake, Warren Island, Clark Fork River, Boundary Creek, Algoma Lake, Twin Lakes, and Coeur d'Alene River. Also, enhance habitat on Pend Oreille Lake by developing 6 subimpoundments (preferably in the Cocolalla Creek, Little Mallard Bay, lower Muskrat Lake, Denton Slough, Swan Bay, and Riley Creek areas). Provide additional benefits of 20 mallard HU's, 70 Canada goose HU's, 150 breeding bald eagle HU's and 80 wintering bald eagle HU's, preferably by protecting and enhancing habitat at Oden Bay. Years 1 to 5, advance design. Years 1 to 10, implementation. Years 2 through life of Albani Falls project,
Canada goose	4,699 HU's	
Bald eagle - breeding	4,508 HU's	
Black-capped chickadee (forested wetland)	4,365 HU's	
Yellow warbler (scrub-shrub wetland)	2,286 HU's	
White-tailed deer	gained 71 HU's	
Muskrat	1,680 HU's	
	1,756 HU's	

Table 12, continued.

Target Species	Habitat Losses Attributable to Hydropower	Mitigation Goals
Redhead - wintering	3,379 HU's	Provide benefits of 3,380 wintering redhead HU's, preferably by protecting and enhancing 240 acres in the Oden Bay area, and protecting and/or enhancing enough habitat to provide an additional 2,210 wintering redhead HU's in the Pend Oreille Lake area. This project will require investigations of Pend Oreille Lake aquatic plants and wintering redhead feeding behavior. Years 1 to 5, advance design. Years 2 to 10, implementation. Years 2 through life of Albeni Falls project, annual operation, maintenance, and monitoring.
Peregrine falcon	Losses of wetland habitat.	Reintroduce peregrines into suitable historical habitat in the Pend Oreille Lake vicinity by establishing and operating 3 hack sites for at least 10 years, and releasing 3 to 5 peregrines annually from each site.

Table 13. Estimated benefits (Habitat Units) of Albeni Falls mitigation proposals. Proposals to mitigate past hydroelectric impacts are listed in order of priorities chosen by the interagency work group.

Proposal	Target Species								
	Mallard	Canada goose	Redhead	Bald eagle breeding	Bald eagle wintering	Black-capped chickadee	Yellow warbler	White-tailed deer	Muskrat	Total
Proposals to Mitigate Future Hydroelectric Impacts										
Clark Fork Delta breakwater	(Protect existing wildlife habitat from erosion.)									
Priest River Islands protection	(Protect existing wildlife habitat from erosion.)									
Proposals to Mitigate Past Hydroelectric Impacts										
Clark Fork Delta area, (1,800ac)	1,020	1,380		1,280	1,250	850	120	810	350	7,060
Pack River area (1,300ac)	2,040	710			230	550	210	660	120	4,520
Pend Oreille River area (809ac)	230	450		720	720	100	70	160	40	2,490
Pend Oreille Lake (6 subimpoundments)	540	480				40	20	60	300	1,440
Spirit Lake area (246ac)	200	100				20	30	40	60	450
Hoodoo Creek/Lake area (2,210ac)	1,630	950				220	100	510	470	3,880
Oden Bay redhead protection (240ac)	20	70	1,170	150	80					1,490

Table 13, continued.

Proposal	Target Species									
	Mallard	Canada goose	Redhead	Bald eagle breeding	Bald eagle wintering	Black-capped chickadee	Yellow warbler	White-tailed deer	Muskrat	Total
Pend Oreille redhead projects			2,210							2,210
Westmond Lake area (130ac)	140	80							60	280
Peregrine reintroduction (3 hack sites)										
Pend Oreille Lake goose enhancement		60								60
Bald eagle projects (780ac)	140	110		570	500	50	10	90	70	1,540
Boundary Creek area (55ac)	30			50	50	40		40		210
Algoma Lake area (90ac)	60	40							20	120
Twin Lakes area (462ac)	430	250				10	40		170	900
Coeur d'Alene River area (830ac)	400	280		360	420	110	60	170	140	1,940
							-	-	-	
TOTAL ESTIMATED BENEFITS	6,880	4,960	3,380	3,130	3,250	1,990	660	2,540	1,800	28,590
NET HYDROELECTRIC IMPACTS	-5,985	-4,699	-3,379	-4,508	-4,365	-2,286	t71	-1,680	-1,756	-28,587

Table 14. Estimated costs of Albeni Falls mitigation plan. After implementation, annual operation, maintenance, and monitoring will continue to be necessary to sustain project benefits. Proposals to mitigate past hydroelectric impacts are listed in order of priorities chosen by the interagency work group.

Proposal	Initial Costs		Annual Costs	
	Advance Design	Implementation	Operation and Maintenance	Monitoring
Proposals to Mitigate Future Hydroelectric Impacts				
Clark Fork Delta breakwater	100,000	2,000,000	20,000	2,000
Priest River Islands protection	25,OOO	100,000	5,000	1,000
Proposals to Mitigate Past Hydroelectric Impacts				
Clark Fork Delta area (1,800ac)	85,000	1,027,OOO	17,000	8,000
Pack River area (1,300ac)	55,000	1,035,000	14,000	5,000
Pend Oreille River area (809ac)	27,000	724,000	14,000	19,000
Pend Oreille Lake (6 subimpoundments)	100,000	909,000	20,000	4,000
Spirit Lake area (246ac)	20,000	269,000	6,000	2,000
Hoodoo Creek/Lake area (2,2lOac)	100,000	1,414,000	30,000	5,000
Oden. Bay redhead protection (240ac)	10,000	1.671.000	2,000	2,000

Table 14. continued.

Proposal	Initial Costs: Advance Design	Initial Costs: Implementation	Annual Costs: Operation and Maintenance	Annual Costs: Monitoring
Pend Oreille redhead projects	Investigations are needed before specific projects can be proposed.			
Westmond area (130ac)	15,000	110,000	2,000	2,000
Peregrine reintroductions (3 hack sites)	10,000	510,000	3,000	4,000
Pend Oreille Lake goose enhancement	10,000	13,000	8,000	3,000
Bald eagle projects (780ac)	30,000	990,000	10,000	3,000
Boundary Creek area (55ac	10,000	68,000	3,000	2,000
Algoma Lake area (90ac)	20,000	91,000	2,000	2,000
Twin Lakes area (462ac)	20,000	466,000	6,000	2,000
Coeur d'Alene River area (830ac)	30,000	582,000	8,000	2,000
	$667,000	$11,979,000	$170,000	$68,000
TOTAL INITIAL COSTS		$12,646,000		
ANNUAL COSTS FOR LIFE OF ALBENI FALLS PROJECT				$238,000

Alternative Mitigation Proposals

The following alternative mitigation proposals were considered by the interagency work group. It is the work group's understanding that should future circumstances dictate that a preferred mitigation project is not feasible, then alternative projects would be added to the mitigation plan until the loss of the preferred project (in terms of target species' HU's) would be compensated for. Proposals are listed in order of work group priority.

Coeur d'Alene River protection/enhancement. Protect and enhance additional wetlands in **the** lower Coeur d'Alene River area, through acquisition of easements or fee-titles from willing sellers. A large acreage of wetlands are under private ownership in the area. The IDFG Coeur d'Alene River Wildlife Management Area encompasses all or portions of 13 small to moderately sized shallow lakes and 16 additional separate marshland segments in the lower Coeur d'Alene River area.

Benefits: Protection and enhancement of 1,000 acres of wetland and upland habitat in the lower Coeur d'Alene River would result in substantial benefits to a variety of wetland wildlife species. This project will complement the Pacific Bald Eagle Recovery Plan, Zone 7 goal of having one nesting pair of bald eagles established in the Coeur d'Alene River area. This project will also complement the IDFG goal of acquiring remaining critical parcels of land (wetlands) within the Coeur d'Alene WMA boundary.

Target Species	HU's
Mallard	810
Canada goose	570
Bald eagle - breeding	730
Bald eagle - wintering	860
Black-capped chickadee	220
Yellow warbler	130
Muskrat	260
Total	3,580

Costs: Advance design planning includes costs associated with identification of willing sellers, surveys, preparation of management plans, and soliciting bids and quotes. Implementation includes the costs of the acquisition of fee-titles or easements, appraisals, legal fees, dike and water control construction, goose nesting platform and fence construction, and cottonwood and willow plantings. Annual operation, maintenance, and monitoring will be necessary to sustain annual wildlife benefits.

Advance Design	30,000
Implementation	870,000
Total	900,000
Operation and Maintenance	8,000
Monitoring	2,000
Annual Costs for Life of Albeni Falls Project	10,000

St. Joe River and St. Maries River protection/enhancement. Protect and enhance wetlands and uplands in the vicinity of the confluence of the St. Maries and St. Joe Rivers, through acquisition of easements or fee-titles'from willing sellers. Enhancement measures would include cottonwood and willow plantings, dikes and water control structures to create permanent marshes, goose platform construction, fencing, and goose pasture management.

Benefits: Protection and enhancement of about 1,550 acres of wetlands and 200 acres of uplands would result in the following estimated benefits to target wildlife species. This project will help alleviate problems associated with losses of wetlands, and it complements agency and tribal goals outlined in the "Target species impacts, status, and management goals" section.

Target Species	HU's
Mallard	1,440
Canada goose	930
Black-capped chickadee	350
Yellow warbler	290
White-tailed deer	680
Muskrat	500
Total	4,190

Costs: Advance design planning includes costs associated with identification of willing sellers, surveys, preparation of management plans, and soliciting bids and quotes. Implementation includes the costs of acquisition of fee-titles or easements, appraisals, legal fees, dike and water control construction, goose platform and fence construction, and cottonwood and willow planting. Annual operation, maintenance, and monitoring will be necessary to sustain annual wildlife benefits.

Advance Design	30,000
Implementation	1,300,000
Total	1,330,000
Operation and Maintenance	8,000
Monitoring	2,000
Annual Costs for Life of Albeni Falls Project	10,000

Bald eagle islands. Protect three islands (28 acres) on Pend Oreille Lake by acquiring fee-titles or easements if sellers are willing. Protecting these islands from human disturbance and development is predicted to result in the establishment of two bald eagle nesting territories. Enhancement of these islands would include nest structure construction and maintenance. Two of the islands (Cottage and Pearl) are located in a "heavy use" area for wintering bald eagles, and one island (Memaloose) is in a "moderate use" wintering area (Crenshaw 1988).

Benefits: Protection of the three islands is expected to benefit wintering and breeding bald eagles, potentially resulting in two nesting territories becoming established. This project would complement the Pacific Bald Eagle Recovery Plan.

Target Species	HU's
Bald eagle,- breeding	25
Bald eagle - wintering	25
Total	50

Costs: Advance design would include identifying willing sellers and preparing a management plan. Implementation would include costs of obtaining appraisals, acquiring fee-titles or easements, and constructing nest structures. Operation, maintenance and monitoring would be necessary to maintain the islands in optimum condition for eagles.

Advance Design	10,000
Implementation	1,050,000
Total	1,060,OOO
Operation and Maintenance	3,000
Monitoring	1,000
Annual Costs for Life of Albeni Falls Project	4,000

Pack River Island enhancement. Construct a series of 20 one-acre islands (430' X 100') in the Pack River Delta, upstream from the railroad trestle. This area is currently under Corps ownership. Island material would be pushed up from all sides, so that during low water in early spring, a ditch filled with water would surround each island. Approximately one acre of open water would be associated with each one acre island in early spring. Five islands would be managed primarily for goose brood pasture. Two goose nesting platforms would be constructed on each island.

Benefits: Construction of these islands would provide permanent nesting cover for waterfowl, and brood pasture for Canada geese. This project will help alleviate problems associated with losses of wetlands, and it complements agency and tribal goals outlined in the "Target species impacts, status, and management goals" section.

Target Species	HU's
Mallard	20
Canada goose	20
Total	40

Costs: Advance design includes costs associated with surveys, preparation of a management plan, and soliciting bids and quotes. Implementation includes the costs of island construction, vegetation establishment, and goose platform construction. Annual operation, maintenance, and monitoring would be necessary to sustain annual wildlife benefits of the project.

Advance Design	20,000
Implementation	103,000
Total	123,000
Operation and Maintenance	5,000
Monitoring	2,000
Annual Costs for Life of Albeni Falls Project	7,000

Wetland protection/enhancement, northern Idaho vicinity. Protect and/or enhance additional wetlands in the vicinity of northern Idaho, if portions of projects in the preferred mitigation plan are found in the future to not be feasible. Several unprotected wetlands are interspersed throughout the northern Idaho area and are threatened by development. Benefits and costs of this project would vary, based on actual wetlands protected.

Howe Mountain/Antelope Mountain whitetail winter range protection/ enhancement. Protect and enhance about 500 acres of whitetail winter range in the vicinity of Howe Mountain and Antelope Mountain, through acquisition of fee-titles or easements from willing sellers of private land. The purpose of the project is to protect whitetail thermal cover and forage on southeast facing slopes above the Clark Fork Delta. This winter range is now partly in private ownership and partly in BLM ownership. Periodic underburning would maintain shrub growth and preserve a forage base for wintering whitetails.

Benefits: This project will benefit both wintering whitetails and elk.

Target Species	HU's
White-tailed deer	400

Costs: Advance design includes costs associated with the identification of willing sellers, surveys, preparation of management plans, and soliciting bids and quotes. Implementation includes the costs of fee-title acquisitions or easements, appraisals, legal fees, and underburning. Annual operation, maintenance and monitoring will be necessary to sustain annual wildlife benefits.

Advance Design	5,000
Implementation	291,000
Total	296,000
Operation and Maintenance	2,000
Monitoring	2,000
Annual Costs for Life of Albeni Falls Project	4,000

Pend Oreille Lake wetland creation. Development and operation of the Albeni Falls hydroelectric project has caused the loss of about 6,600 acres of wetlands at Pend Oreille Lake. As a result of project operations, losses have occurred within the "fluctuation zone," the area between the elevations of 2,062.5 and 2,051 feet. These impacts would be mitigated by creating 6,600 acres of wetlands in this fluctuation zone. Areas that presently are mudflats at low water could have their elevations raised with dredging and/or fill. The areas would have to be raised to a level higher than normal high water, and would have to be protected from erosion. Extensive planting of wetland species would be necessary. Detailed engineering/planning studies would be required. It would also be necessary to acquire about 3,000 acres of private land that are presently under a flowage easement with the Corps.

Benefits: Creating 6,600 acres of wetlands in the same areas that have been lost due to Albeni Falls Project operations would replace most of the losses from the hydroproject in time. However, altered water levels would still be occurring, and habitat features like old-growth cottonwood stands would take many decades to develop.

costs: Preliminary Corps cost estimates for dredge disposal for this type of wetland creation range from 10 to 20 million dollars for 1,000 acres. Extrapolated to 6,600 acres, a rough cost estimate would range from 66 to 132 million dollars, for only a portion of implementation. Other project development costs would need to be determined.

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APPENDIX A

Acronyms Used

BLM - Bureau of Land Management

BPA - Bonneville Power Administration

cfs - cubic feet per second

cws - Canadian Wildlife Service

HEP - Habitat Evaluation Procedure

HSI - Habitat Suitability Index

HU - Habitat Unit

IDFG - Idaho Department of Fish and Game

SI - Suitability Index

UCUT - Upper Columbia United Tribes

USACE - U.S. Army Corps of Engineers

USFS - U.S. Forest Service

USFWS - U.S. Fish and Wildlife Service

WMA - Wildlife Management Area (Idaho Department of Fish and Game)

APPENDIX B

Mallard Model for
Albeni Falls Loss Assessment and Mitigation Plan
(Breeding Season Only)

This model uses variables from other models that are considered to be either appropriate for Lake Pend Oreille or appropriate for the level of detail we will be able to investigate given the time frame. The model relies as much as possible on the use of aerial photography and maps. Field measurements are limited.

The model *was* developed under the following assumptions:

1. The distance between nesting cover and brood rearing areas is not a limiting factor at Lake Pend Oreille either pre- or post-project. This variable was not used.

2. The availability of grain crops as food was not considered an important habitat feature for the Lake Pend Oreille area.

During the early stages of evaluation the team should take a close look at the proposed model variables and make adjustments as needed. Variables can be added or deleted as appropriate.

Habitat Suitability Index
Mallard (Anas platyrhyncos)
Breeding Season Only

Life Requisite Values

Food (X_1)--Related to the area of various wetland types within a sampling area that are shallow enough for a dabbling duck to feed (<60 cm water depth is optimum) during the breeding season. Model assumes that seasonally flooded wetlands (i.e. wet meadows, etc.) provide a better food source than permanently flooded wetlands.

Reproduction (X2)--Related to the height and density of nesting cover (residual vegetation).

Cover (X3)--Related to the percent of shoreline dominated by emergent or scrub-shrub wetland vegetation. Shorelines with little or no vegetation provide marginal escape cover for broods. Only wetlands with open water available during the brooding season should be evaluated.

Interspersion (X4)--Related to the availability of several kinds of wetlands and upland areas capable of satisfying specific seasonal needs.

Habitat Evaluation Criteria

Food : Seasonal wetlands, which produce highest quantities of aquatic invertebrates (McKnight and Low 1969). are preferred feeding habitat for laying mallard hens (Dwyer et al. 1979; Krapu et al. 1983; Cowardin et al. 1983). Duebbert et al. (1983) found the density of mallard pairs/hectare to be higher in seasonal than semipermanent wetlands.

Xl =

A - Temporarily flooded: surface water is present for brief periods during growing season. SI value = 0.3

B - Seasonally flooded: surface water is present for extended periods especially early in the growing season, but is absent by the end of the season in most years. SI value = 1.0

C - Semipermanent ly flooded : surface water persists throughout the growing season during most years. SI value = 0.8

D - Permanent flooded: water covers the land surface throughout the year in all years. Vegetation is composed of obligate hydrophytes (Cowardin et al. 1979). SI value = 0.5

Reproduction : Mallard nesting success is the highest in cover with the greatest height-density of residual vegetation (i.e. concealed from all directions) (Miller and Collins 1954; Wheeler and Harris 1970; Kirsch et al. 1978; Kolemoen et al. 1984; Cowardline et al. 1985). See Robe1 et al. (1970) for explanation of visual obstruction technique. Reproduction value (X2) is a function of the height and density of nesting cover (residual vegetation).

Cover: Mallard broods will utilize wetlands having sparse to dense emergent or scrub-shrub vegetation. Wetlands devoid of wetland vegetation or open water are usually avoided. Marshes with shorelines bare of emergent vegetation are used less (Berg 1956; Godin and Joyner 1981; Talent et al. 1982; Rumble and Flake 1983).

X3 = Percent of shoreline dominated by emergent and/or scrub-shrub wetland vegetation for brood rearing wetlands ($\geq$2 acres in size with some open water during brooding season).

A - 50% to 100% of shoreline. SI value = 0.7 to 1.0

B - 15% to 50% of shoreline. SI value = 0.4 to 0.6

C - 0% to 15% of shoreline. SI value = 0.1 to 0.3

Interspersion: The mallard utilizes a variety of wetland types for various life functions. Optimal mallard habitat will contain a variety of wetland types and sizes within close proximity of each other and upland nesting habitat. The lack of several wetland types can be compensated for by large water bodies, diverse in physical composition and that contain both shallow and deep sections. Evaluate interspersion value primarily using the criteria listed below.

X4 = The number of wetland types (i.e. emergent, scrub-shrub, wet meadow, open water) and upland nesting areas within sampling area (must be at least 640 acres in size). The sampling area with the highest interspersion index will be assigned an SI value of 1.0. All other areas will be assigned an SI value in relation to this index number.

The Habitat Suitability Index is the Lowest X_n Value

Suggested Measurement Techniques

Large sampling areas (≥640 acres) that are representative of distinct sections of the lake should be randomly selected. At least four sampling areas per section should be used. Variables X_1, X3, and X4 can be measured from aerial photography with field ground truthing. Variable X2 should be measured in the field in upland habitat types adjacent to wetlands. Specific suggestions on measurement techniques for each variable are provided below.

Xl = Calculate area of various wetland types within each sampling area using dot grid or planimeter. Multiply each wetland area by its SI for a weighted value. Sum the weighted values in the sampling area and divide by the total wetland acreage for a weighted sample area SI value.

X2 = Field measure height and density of residual vegetation using the visual obstruction technique (see handout). Sampling areas should be located on aerial photographs.

X3 = Measure the amount of shoreline vegetation for each wetland type ≥2 acres in size and with some open water during brood-rearing season from aerial photographs. Calculate SI value for each wetland based on measurements. Multiply SI value times wetland area for a weighted value. A standard for lacustrine systems (i.e. littoral zone or 100 meters from shore) will need to be established as providing brood-rearing habitat. Sum weighted values in each sampling area and divide by total wetland acreage for a sample area SI value. Some field verification of shoreline vegetation should be conducted.

X4 = Calculate the interspersion index for each sampling area from aerial photos (see handout). The sampling area with the highest interspersion index will be assigned an SI value of 1.0. All other sampling areas will be assigned an SI in relation to this index value.

Canada Goose Model for
Albeni Falls Loss Assessment and Mitigation Plan
(Breeding Season Only)

This model was modified from a model developed during the wildlife impact assessment for Palisades Reservoir (Sather-Blair and Preston 1985). This Albeni Falls model was developed to describe the quality of goose breeding habitat around Pend Oreille Lake prior to Albeni Dam, as well as current conditions at the Lake. The model recognized that the quality of shoreline habitat, the presence of islands, and the accessibility and quality of brood-rearing habitat are the most important components determining the quality of Canada goose breeding habitat.

Nesting

Islands

0.8 - 1.0

Stable islands present; relatively high shoreline/area ratios;
Ground cover on portions of islands 4 inches to 16 inches high:
Brood habitat is within 1 mile of area.

0.5 - 0.7

Stable islands present; relatively low shoreline/area ratio: or
Cover on islands <4 inches or >16 inches: or
Brood habitat is 1 to 2 miles from area.

0.0 - 0.4

No stable islands; or
Islands with limited or no cover; or
Brood habitat >2 miles away.

Shoreline Habitat

0.5

Portions of cover within 10 meters of water:
Ground cover 4 inches to 16 inches:
Wetland buffer within 50 meters of shoreline, may include sloughs of open water:
Brood habitat within 1 mile.

0.3 - 0.4

Portions of shoreline cover within 10 meters of water:
Ground cover 4 inches to 16 inches;
Adjacent wetland buffer within 50 meters of shoreline (does not include open water sloughs, rather forested wetlands or emergent wetlands); or
Brood habitat 1 to 2 miles away.

0.0 - 0.2

No shoreline cover, or shoreline cover taller than 16 inches and/or very dense; or
Wetland buffer <50 meters to absent: or
Brood habitat >2 miles away.

Brood-rearing

0.7 - 1.0

Brood pasture easily accessible from main water body:
Foraging zones common:
Vegetation <4 inches tall,
Average >l acre in size;
Open water wetlands are present:
Within 1 mile of nesting habitat.

0.4 - 0.6

Less than above and/or no open water wetlands; or
Area is 1 to 2 miles from nesting habitat.

0.0 - 0.3

Little to no brooding area; or
Area is >2 miles from nesting habitat.

Model

$$HSI = \frac{\text{Nesting Suitability Index} + \text{Brood-rearing Suitability Index}}{2}$$

Bald Eagle Model for
Albeni Falls Loss Assessment and Mitigation Plan

This model was developed during the Palisades wildlife impact assessment (Sather-Blair and Preston 1985). The model recognizes that proximity to prey base, quality of prey base, quality of nesting and perching habitat, and amount of human disturbance are the most important components determining the quality of breeding and wintering bald eagle habitat.

I_1 Food requirements.

A. Abundant prey base (ungulate carrion, fish of several species, waterfowl, small mammals) available throughout year within three miles of potential nest/perch site. Suitability Index (SI) value = 1.0

B. Moderate prey availability within three miles of potential nest or perch sites. Water sometimes frozen over early in the nesting period, but some ungulate carrion available during that time. Alternative food sources may be within five miles of nest or perch. SI value = 0.8

C. Minimal prey base within five miles of potential nest or perch sites. Water frozen over late into nesting cycle without alternative food sources. SI value = 0.3

D. Insufficient prey base to sustain eagles. SI value = 0.0

12 Nest/perch structure: type, form, density.

A. Old growth spruce, Douglas fir, or ponderosa pine in coniferous areas: old growth cottonwood in deciduous stands; stands dense and continuous and exceeding 10 acres in size. SI value = 1.0

B. Scattered old growth trees in stands of moderate (mature) aged trees (cottonwoods/spruce/fir/ponderosa pine) exceeding 10 acres in size. SI value = 0.9

C. Scattered old growth trees (spruce/fir/cottonwoods/ponderosa pine) in open areas (without screening from younger aged trees). SI value = 0.6

D. Dominant trees available are old growth lodgepole pine or aspen within continuous conifer or deciduous stands respectively. SI value = 0.4

E. Potential nest or perch structures are shrubs or young trees, no screening present. SI value = 0.0

I_3 Distance to water body with sufficient prey availability.

A. <1 kilometer. SI value = 1.0

8. 2 kilometers. SI value = 0.9

C. 3 kilometers. SI value = 0.6

D. 4 kilometers. SI value = 0.2

E. >4.5 kilometers. SI value = 0.0

I4 Human activity level.

A. Natural vegetation dominates area; no permanent developments or human structures: no human activity within the area during the nesting period. SI value = 1.0

B. Area of farming ground or pasture surrounds site; occasional use of area by predictable humans, such as a farmer or stockman; human activity occurs late in the eagle nesting cycle. SI value = 0.9

C. Dispersed recreation campsites or trails, or occasionally used boat docks within vicinity of potential nest or perch; activity occurs during brooding period only. SI value = 0.4

D. Developed sites, e.g. campgrounds, boat launches, etc., within vicinity of potential nest or perch: heavy human use of area during incubation period. SI value = 0.0

Equation:

I_1 = suitability index for food availability.

I2 = suitability index for nest/perch structures.

I3 = suitability index for prey availability.

I_4 = suitability index for human activity level.

Food suitability index value, spring/summer/fall = I_1

Food suitability index value, winter = II

Reproductive suitability index value = $(12 \times I3 \times I_4)^{1/3}$

Winter perch suitability index value = 12

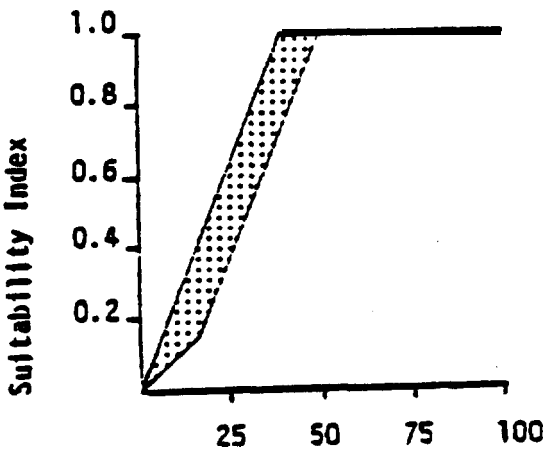
Wintering bald eagle habitat suitability index value = $[(I_1)^2 \times 1211'3$

Breeding bald eagle habitat suitability index value is the lower of food or reproductive suitability index values.

White-tailed Deer Model for
Albeni Falls Loss Assessment and Mitigation Plan
(Winter Only)

This Suitability Index curve was developed as part of a white-tailed deer model used on the Little Calumet project, The Albeni Falls work group felt that the most important components determining the quality of whitetail winter habitat are available browse, snow depth, and security cover. It was felt that snow depth and cover do not limit whitetails in the Albeni Falls study area, compared to the importance of available browse. Therefore, this Suitability Index alone was used to determine whitetail winter habitat quality in this study area.

OF, DFW, DSW [V_4] % shrub crown cover < 1.5 m (5 ft) in height.



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APPENDIX C

Minutes of Coordination Meetings

Albeni Falls Coordination Mailing List

Pam Barrow
Pacific Northwest Utilities Conference Committee
520 S. W. 6th Ave., Ste. 505
Portland, OR 97204

Mel Branch
H.C.R. 01, Box 405
Naples, ID 83847

Ken Brunner
Environmental Resources Section
U.S. Army Corps of Engineers, Seattle District
P.O. Box C-3755
Seattle, WA 98124

John Coyle
Albeni Falls Dam
P.O. Box 310
Newport, WA 99158

Paul Hanna
Idaho Department of Fish and Game, Region 1
2320 Government Way
Coeur d'Alene. ID 83814

Paul Harrington
Idaho Panhandle National Forests
1201 Ironwood Dr.
Coeur d'Alene, ID 83814

Eileen McLanahan
Upper Columbia United Tribes' Fisheries
Eastern Washington University
Biology Dept.
Mail Stop 72
Cheney, WA 99004-9989

Jim Meyer
Bonneville Power Administration
Division of Fish and Wildlife, PJS
P.O. Box 3621
Portland, OR 97208

Marty Montgomery
Northwest Power Planning Council
Statehouse Mail
Boise, ID 83720

Jerry Neufeld
Idaho Department of Fish and Game, Region 1
2320 Government Way
Coeur d'Alene, ID 83814

Signe Sather-Blair
U.S. Fish and Wildlife Service
Division of Ecological Services
4696 Overland Rd., Rm. 576
Boise, ID 83705

Dr. Allan T. Scholz, Director
Upper Columbia United Tribes' Fisheries
Eastern Washington University
Biology Dept.
Mail Stop 72
Cheney, WA 99004-9989

Minutes
of
Albeni Falls Wildlife Protection, Mitigation, and
Enhancement Planning Coordination Meeting

October 8, 1987
Coeur d'Alene, Idaho

The following people attended:

Dave Bonga	Kalispel Tribes	509-445-1147
Brian Collins	Upper Columbia United Tribes	509-448-7249
John Coyle	U.S. Army Corps of Engineers	208-437-3133
Paul Hanna	Idaho Department of Fish and Game	208-765-3111
Paul Harrington	U.S. Forest Service	208-765-7411
Bob Martin	Idaho Department of Fish and Game	208-334-5057
Allyn Meuleman	Idaho Department of Fish and Game	208-334-5057
Jerry Neufeld	Idaho Department of Fish and Game	208-765-3111
Allan Scholz	Upper Columbia United Tribes	509-359-6397

The interagency work group discussed a number of topics related to' wildlife mitigation planning for the Albeni Falls hydroelectric project. We reviewed the Columbia River Basin Fish and Wildlife Program and the history of the Albeni Falls Project. We reviewed the Albeni Falls contract work statement and discussed methodology for fulfilling the contract. We also discussed consultation and coordination needed from the work group.

A list of target/indicator species was developed. It included bald eagle, mallard, redhead, white-tailed deer, ruffed grouse, muskrat, yellow warbler, black-capped chickadee, and Canada goose.

The work group agreed to conduct a habitat-based impact assessment using the Habitat Evaluation Procedures, in conjunction with any available wildlife population data.

The work group also agreed to conduct a field work session November 3-6 as part of the assessment of wildlife impacts.

Minutes
of
Albeni Falls Wildlife Protection, Mitigation
and Enhancement Planning
Consultation/Coordination Meeting
March 16 and 17, 1988
Sandpoint, Idaho

The following people attended:

Name	Agency	Phone
Mel Branch	Idaho Fish and Game Department	208-267-2921
Ken Brunner	U.S. Army Corps of Engineers	206-764-3625
Brian Collins	Upper Columbia United Tribes	509-448-7249
John Coyle	Army Corps of Engineers	208-437-3133
Paul Hanna	Idaho Fish and Game Department	208-765-3111
Jerome Hansen	Idaho Fish and Game Department	208-334-5057
Paul Harrington	U.S. Forest Service	208-765-7411
Bob Martin	Idaho Fish and Game Department	208-334-5057
Eileen McLanahan	Upper Columbia United Tribes	509-359-2523
Allyn Meuleman	Idaho Fish and Game Department	208-334-5057
Marty Montgomery	Northwest Power Planning Council	208-334-2843
Jerry Neufeld	Idaho Fish and Game Department	208-765-3111
Signe Sather-Blair	U.S. Fish and Wildlife Service	208-334-1931
Allan Scholz	Upper Columbia United Tribes	509-359-6397

The major objectives of the meeting were to review the draft results of the wildlife impact assessment and discuss potential mitigation projects proposed by the interagency work group. A field tour was held during a portion of the second day of the meeting, in order to acquaint work group members with some of the proposed mitigation projects.

Impact Assessment Review

Information on target species management plans and goals and social significance of wildlife was requested from the interagency work group. The draft wildlife impact assessment was reviewed. IDFG pointed out that the study area did not include a lot of the area around Pend Oreille Lake because the fluctuation zone on many of the steep areas was relatively small.

After some discussion, the work group agreed that the breeding mallard impact assessment area should include at least a 100 meter band of terrestrial habitat bordering the high water line. USFWS pointed out that Bellrose (1976) had concluded that most of the habitat needs of breeding mallards are met within 100 meters of open water. Therefore, the mallard study area is to extend uphill from the high water line either 100 meters, or to the Corps take line, whichever is farther. IDFG pointed out that the interspersion index had worked well on mallards during the HEP.

Black-capped chickadee (forested wetlands) and yellow warbler (scrub-shrub wetland) impacts were reviewed and agreed upon by the work group.

The ongoing annual loss of habitat due to erosion was discussed. The work group agreed that a series of post-project aerial photos could provide good data on the annual loss of habitat presently occurring. USACE indicated that they would look into their existing supply of aerial photos for this kind of information. IDFG indicated that they would talk to Water Resources about possible sources of aerial photos.

The impacts of the Albeni Falls Project on white-tailed deer were reviewed and agreed upon by the work group.

Albeni Falls impacts on bald eagles were examined. The work group agreed that the loss of old-growth perch and nest trees had severe impacts on breeding bald eagles. Because the prey base has not measurably changed from pre- to post-construction conditions, the work group agreed that the prey availability variable did not need to be included in the HEP model.

The work group agreed to conduct a field evaluation of proposed mitigation projects during the week of April 11 through 15, 1988. It was also decided to hold the next coordination meeting on either May 10 or 11. The purpose of this meeting will be to prioritize proposed mitigation projects. The exact date will be set contingent on the scheduling of the Power Council meeting in Spokane.

Canada goose impacts were reviewed, discussed, and agreed upon by the work group.

Albeni Falls impacts on muskrats were discussed. The work group agreed that some herbaceous wetlands in the study area do provide year-round habitat, and should be included in the impact assessment. The work group then discussed all herbaceous wetlands in the study area, and agreed on which acreages to include.

Next, the work group examined project impacts on redheads. The USFWS handed out graphs comparing Pend Oreille Lake water levels (pre- and post-construction) and expected growth zones of aquatic plants preferred by redheads. It was felt there has been a change in the quality of the food in Pend Oreille Lake since Albeni Falls was constructed. The work group also felt that human disturbance is negatively impacting redheads. USFWS indicated they would continue examining potential project effects on preferred foods of wintering redheads.

Mitigation Project Review

The work group discussed the broad mitigation goal of replacing the wildlife losses from the Albeni Falls Project. A brief overview was given on each proposed mitigation project. On Thursday morning, the work group went to the field and examined some of the proposed mitigation projects. Sites examined included the Pack River area, Oden Bay, Algoma Slough, and Cocolalla Slough. The meeting and field trip adjourned after lunch.

Minutes
of
Albeni Falls Wildlife Protection, Mitigation
and Enhancement Planning
Consultation/Coordination Meeting
May 9 and 10, 1988
Coeur d'Alene, Idaho

The following people attended:

Name	Agency	Phone
Mel Branch	Idaho Fish and Game Department	(208)267-2921
Ken Brunner	U.S. Army Corps of Engineers	(206)764-3625
Paul Hanna	Idaho Fish and Game Department	(208)765-3111
Jerome Hansen	Idaho Fish and Game Department	(208)334-5057
Paul Harrington	U.S. Forest Service	(208)765-7411
Bob Martin	Idaho Fish and Game Department	(208)334-5057
Eileen McLanahan	Upper Columbia United Tribes	(509)359-2523
Allyn Meuleman	Idaho Fish and Game Department	(208)334-5057
Jerry Neufeld	Idaho Fish and Game Department	(208)765-3111

The work group reviewed and discussed the design of proposed mitigation projects, and their estimated benefits to wildlife. Wildlife mitigation projects were then prioritized by the work group. The prioritized projects will be presented in the draft Albeni Falls Wildlife Protection, Mitigation, and Enhancement Plan.

GAM/sa

APPENDIX D

Comments

IDAHO FISH & GAME
600 South Walnut / Box 25
Boise, Idaho 83707

August 31, 1988

Mr. John Palensky, Director
Division of Fish and Wildlife, PJS
Bonneville Power Administration
P. O. Box 3621
Portland, Oregon 97208

Dear Mr. Palensky:

Enclosed is the Albeni Falls Wildlife Protection, Mitigation, and Enhancement Plan. This planning effort was funded by the Bonneville Power Administration pursuant to sections 1003(b)(2) and (3) of the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program. This plan was prepared by the Idaho Department of Fish and Game, in consultation and coordination with the U. S. Army Corps of Engineers, Upper Columbia United Tribes, U. S. Fish and Wildlife Service, U. S. Forest Service, Northwest Power Planning Council, Bonneville Power Administration, and Pacific Northwest Utilities Conference Committee.

The Idaho Department of Fish and Game supports the content of this plan. We encourage the Northwest Power Planning Council and Bonneville Power Administration to consider and implement this plan in a timely manner.

Sincerely,

Jerry M. Conley
Director

JMC: AM: db

Enclosure

Cecil D. Andrus / Governor
Jerry M. Conley / Director

United States Department of the Interior

FISH AND WILDLIFE SERVICE
BOISE FIELD OFFICE
4696 Overland Road, Room 576
Boiae, Idaho 83706

July 29, 1999

Mr. Jerry Conley, Director
Idaho Department of Pieb and Game
600 S. Walnut
Boise, Idaho 83706

Re: Albeni Falls Wildlife Protection, Mitigation and Enhancement Plan

Dear Mr. Conley:

The Fish and Wildlife Service (Service) has reviewed the ● ub,ject draft report and has the following general and specific commenta:

general Commenta:

The Service has been an active participant throughout development Of thia plan. The findings and recommendations represent those of the interagency work group and we endorse the plan.

The impacts to wetlands and deep-water habitats of Lake Pend Oreille as a reault of the development and operation of the Albeni Falls Project have been much greater than anticipated during project planning in the early 1960's. As noted in the document, wetlands are very scarce in Idaho representing less than 0.6 percent of the land surface (Boccard 1980). They are also some of the moat valuable habitats for a variety of wildlife. The plan emphasizes protection and enhancement of wetlands at Lake Pend Oreille which is consistent and compliments a variety of federal directives and laws that deal with wetland protection. We will discuss aome of those further in specific comments.

Specific Comments

page 12 A better description of the study area would be helpful to those raadera unfamiliar with Lake Pend Oreille. A liat of dominant plant species associated with the major cover types would be helpful. Descriptions of pre-construction and post-construction conditiona is needed for the reader to better understand what habitat cbangea have occurred. The Coordination Act Report (USFWS 1963) and the letter from the Service to the

page 12 Incorporated into text.

Corps dated December 13, 1950 (previously provided to you) describes pre-construction habitat conditions. The report on wetlands (Econ. Inc. 1979) provides descriptions on current habitat conditions.

page 17 The variables used to evaluate habitat conditions for each evaluation species should be identified. It would also be helpful if there was a brief explanation on why the particular variables are important in describing the evaluation species habitat. A more thorough description of methods would be helpful.

Typically, when discussing model variables used in Habitat Evaluation Procedures (HEP) individual variables are referred to as Suitability Indices or SI's. The Habitat Suitability Index (HSI) is defined as "... a numerical index that represents the capacity of a given habitat to support a selected fish or wildlife species" (USFWS 1981: 1.1). The HSI represents the overall habitat suitability for a cover type integrating the individual SI's.

page 17 Incorporated into text.

page 26 A better description of habitat conditions is needed. For example, it should be pointed out that the herbaceous wetland cover type is made up of several wetland types depending on water regime. Large areas of wet and dry meadows, and shallow and deep marshes existed in what is now an open water area during summer and a mudflat area during winter. The water regime gradient during the pre-project period that created the variety of wetland types also created conditions to support a wide variety of wetland plants that are important food sources for waterfowl and furbearers. Prior to construction, sedges (Carex spp.), spikerushes (Eleocharis palustris), arrowhead (Sagittaria platyphylla), bullrushes (Scirpus spp.), and smartweeds (Polygonum spp.) were listed as common wetland plants around Lake Pend Oreille. These are valuable waterfowl food plants (Martin et al., 1951) and their distribution around the lake today is limited. Today the dominant wetland plants are cattails (Typha spp.) and reed canary grass (Phalaris arundinacea), both of which are tolerant of prolonged drawdown. Reed canarygrass has little value as a waterfowl food plant other than forage for Canada geese. This information suggests that there has been a loss in not only the amount of herbaceous wetlands but a loss in plant species diversity and richness that has reduced waterfowl habitat quality.

page 26 Incorporated into text.

A similar, yet less obvious change, has likely occurred to the aquatic macrophyte communities that exist in the littoral or photic zone of Lake Pend Oreille. The attached figures illustrate what has likely occurred to the general distribution of some selected aquatic plants as a result of project operations in Oden Bay.[1] Potamogeton gramineus, P. zosteriformis and Chara spp. were identified as common in Lake Pend Oreille prior to project construction (USFWS letter to Corps dated December 13, 1950). Potamogeton spp. are considered some of the most important food plants for a wide variety of waterfowl species. Chara spp. is also an important food, particularly for redheads (Martin et al., 1951). The current operations of the project, which keeps water levels at elevation 2062, favor aquatic plant species that tolerate deeper water conditions (i.e., Chara spp. and Nitella spp.). The winter drawdown has eliminated, or at least greatly reduced, the optimum growth zone for a variety of aquatic and wetland plants that require shallow water conditions during the growing season (i.e., Potamogeton gramineus and Sagittaria platyphylla). As stated earlier, the reduction in abundance and diversity of important waterfowl food plants has affected the habitat quality of Lake Pend Oreille.

page 32 The discussion on impacts to Canada geese should be expanded. A better description of pre- and post-construction habitat conditions would be helpful.

page 32 Incorporated into text.

page 29 While mallards were and are the dominant breeding duck in the study area, other duck species that have similar habitat requirements should be briefly discussed.

page 29 Incorporated into text.

page 34 It is important to note that Lake Pend Oreille, particularly Oden and Sandpoint Bays, support 98% of the wintering redhead population in Idaho and 20% of the Pacific Flyway population. In addition, 10 to 50% of the wintering canvasback population in Idaho is found on the lake (USFWS, unpub. data).

page 34 Incorporated into text.

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1 Bottom profile was plotted using data from U.S.G.S. map of Oden Bay. Optimum depth zones for the aquatic plants were identified assuming an average photic zone of 22 feet in Lake Pend Oreille (Reiman 1975) and applying that to depth distribution data for the subject species provide in Davis and Brinson (1979). Average water levels July - September were used since that is the growth period for aquatic plants in the lake (M. Falter, Univ. of Idaho, pers. commun.).

While the report alludes to how project operations have affected diving duck foraging habitat, a more detailed description would be helpful to thome unfamiliar with the ● ituation.

page 42 An expended discussion on the importance and value of foremted wetlandm would be helpful. Reference the number of species that rely on thim cover type for a portion or all of their life requisites.

page 42 Incorporated into text.

page 62 In 1988 mallard populations in North America are 20% lower than the average population from 1955-1987 (USPWS, unpub. data). Am mentioned in the report, this is largely due to the continued loam of wetlands and the current drought. Am a result of low waterfowl numbers on the continent (particularly mallards, blue-winged teal, canvasbacks, and pintailm), the United States and Canada entered into an agreement that has resulted in the North American Waterfowl Plan. The primary emphasis of the plan is protection and enhancement of wetlandm and other waterfowl habitat in the two countries. Currently, the breading mallard population is at 6.6 million ducks; the plan calls for a goal of 8.7 million. The blue-winged teal population is currently at 3.6 million duckm; the plan ham met a goal for 5.3 million. The protection, mitigation end enhancement plan for Albeni Palls would clearly help to alleviate a very serious problem associated with the waterfowl resources in North America.

page 52 Incorporated into text.

The Service'e management goals for nesting Canada geese is to maintain population levels in the Columbia River drainage (USFWS 1960).

page 53 The latemt population data on redheadm indicate that their population levelm are remaining fairly constant (USFWS, unpub. data). However, the Service ham long recognized the conflict at Lake Pond Oreille between wintering redheadm (and other diving duckm) and shoreline development (USFWS 1980). Protection of key wintering areas (i.e. Oden Say) ham been a management goal for the Service in Idaho.

page 53 Incorporated into text.

Canvaabackm, like mallards, have experienced drastic declines in population levels in recent years. Breeding population levelm in 1986 were 22 percent lower than the average levels from 1955-1967. The current population level is at 435,000 and the North American Waterfowl Plan ham met a goal of 680,000. Considering the importance of Lake Pend Oreille am a wintering area for canvasbacks protection and enhancement of key wintering areas would be consistent with the plan.

page 53 The recovery plans for bald eagles and peregrine falcons define the management goals of the Service for these two endangered species.

page 53 Incorporated into text.

page 55 Forested and scrub-shrub wetlands support a variety of migratory birds and other wildlife. The value of these habitats has been long recognized by the Service. Extensive areas in Idaho have been lost or degraded. In response to these past and continuing losses, the Service identified these areas as unique and scarce on a regional basis. The mitigation goal for these riparian wetlands as defined in the Service's mitigation policy is no net loss of in-kind habitat values. The plan is clearly consistent with this mitigation goal.

The protection and enhancement of riparian wetlands is also consistent with the goals of the Migratory Bird Treaty Act, the Emergency Wetland Protection Act of 1987, and Executive Order 11990.

page 55 Incorporated into text.

page 61 A breakdown of costs for each of the major phases (i.e., advance design, implementation) would be helpful in reviewing the cost estimates. This has been done in the past on other reports. Putting this information in an appendix may be an appropriate format.

page 61 Further breakdown of costs will be done during advance design.

page 96 This table is confusing to read.

page 96 Noted.

<u>Conclusions</u>

The Service agrees and supports the mitigation plan and goals presented. The plan is consistent with the national effort to protect and enhance wetlands and to restore waterfowl population levels to historic levels as defined by the North American Waterfowl Plan.

Portions of the report need additional detail for a better explanation of impacts associated with the project. This would be helpful to readers unfamiliar with Lake Pend Oreille and its wildlife resources. Your staff has done an excellent job coordinating with other agencies to develop this important planning document.

If you have any questions concerning our comments please contact Signe Sather-Blair of this office.

Sincerely,

John P. Wolflin
Field Supervisor

cc: BPA, Portland (Attn: Meyers)
COE, Portland (Attn: Athern)
COE, Seattle (Attn: Brunner)
USFS, Panhandle Forest, Coeur d'Alene (Attn: Harrington)
IDFG, Region 1, Coeur d'Alene (Attn: Neufeld)

Literature Cited

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UPPER *COLUMBIA UNITED TRIBES FISHERIES RESEARCH CENTER*

ADMINISTRATION AND ACCOUNTING OFFICE
P.O. Box 385
Wellpinit, Wa. 99040
509-838-3465

RESEARCH OFFICE
Department of Biology
Eastern Washington University
Cheney, Wa. 99004
509-359-6397

June 27, 1988

Jerry M. Conley, Director
Idaho Department of Fish and Game
600 S. Walnut
Box 25
Boise, Idaho 83707

Dear Mr. Conley,

The Draft Report for the Albeni Falls Wildlife Protection, Mitigation and Enhancement Plan has the full support of the Kalispel Tribe of Indians and Upper Columbia United Tribes. We are especially supportive of the fact that it addresses not only past losses, but protects against future habitat losses, thus ensuring that initial gains (and investments) are preserved over time.

The plan is comprehensive, and addresses all species which have been and continue to be adversely affected by the Albeni Falls facility. It will allow for a coordinated and step-wise mitigation process that should fit very well into the Northwest Power Planning Council's Fish and Wildlife Program.

Finally, we would like to commend the interagency work group for its open approach to considering equally the goals and objectives of each of its participating members.

Sincerely,

Allan T. Scholz

Allan T. Scholz
Director

Sincerely,

Glen Nenema

Glen Nenema
Chairman,
Kalispel Tribe of Indians

cc: Allyn Meuleman
Larry Goodrow, Executive Director, UCUT

United States Department of Agriculture **Forest Service** Idaho Panhandle **National Forests** 1201 Ironwood Drive **Coeur d'Alene. ID 83814**

Caring for the Land and Serving People

JUL

Reply to: **2610** Cooperative Relations Date: June 29, 1988

Subject: Albeni Falls Project Wildlife Impact Assessment and Mitigation Plan.

To: Jerry M. Conley
Director
Idaho Department of Fish and Game
600 South Walnut, Box 25
Boise, Idaho 83707

Dear Mr. Conley,

We have reviewed the Draft Albeni Falls Dam Impact Assessment and Mitigation Plan for wildlife completed by the Department. The Impact assessment appears thorough and adequately describes wildlife impacts as a result of Project. It is interesting that the stabilizing of the lake level during the summer growing season caused a major reduction of emergent and wetlands vegetation.

The mitigation plan goes a long way in attempting to mitigate the losses in wildlife habitat. Although the Habitat Units achieved by the mitigation projects appear to adequately replace the lost habitat, I am not sure that the location is as optimal as what was lost. Unfortunately, the potential for exact replacement or mitigation does not exist as long as the 12 feet drawdown occurs during the winter non-growing season for aquatic and emergent vegetation.

I very much support the mitigation plan as presented, and hope that the projects designed for replacement of lost wildlife habitat can begin in the very near future.

If you have further questions or would like to discuss, please contact myself or my staff.

Janet L. Wold

for William E. Morden
Forest **Supervisor**

JUL 5 1988

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

July 28, 1988

REPLY TO
ATTENTION OF:

Environmental Resources Branch

Mr. Jerry M. Conley, Director
Idaho Department of Fish and Game
600 South Walnut
P.O. Box 25
Boise, Idaho 83707

Dear Mr. Conley:

Enclosed for your consideration are the U.S. Army Corps of Engineers comments on the draft Albeni Falls Wildlife Protection, Mitigation, and Enhancement Plan. This response includes comments from Seattle District and the North Pacific Division. If you have any questions, please call Jim Athearn of this office at (503) 221-2835.

Sincerely,

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

Enclosure

Comments on Draft Report for Albeni Falls
Wildlife Protection, Mitigation, and Enhancement

1. Our comments are limited to the contents of this report and should not be construed to imply endorsement of a mitigation program under the Pacific Northwest Electric Power Planning and Conservation Act for Albeni Falls Project. We have opposed this approach since 1982 both to the Northwest Power Planning Council (NPPC) and Bonneville Power Administration (BPA). We expect the issue to be resolved in the upcoming NPPC review of the wildlife program.

1. Noted.

2. We have recommended that regional plans be prepared by the wildlife agencies, tribes, and NPPC and concentrate on featured wildlife species of regional importance to make the most cost effective use of available funds. Outstanding among these species are the redhead duck, Canada goose, bald eagle, and peregrine falcon.

2. Noted.

3. Page 8 and throughout the report: The reference to "mitigation," "enhancement," and "protection" is confusing. Suggest that use of these terms be clearly defined at the beginning to avoid misunderstanding. We recommend that replacement or compensation for identified losses be considered "mitigation" and that "enhancement" be limited to describing additional proposed habitat improvement beyond estimated losses. "Protection" would be provided to prevent further losses. These definitions would provide consistency with existing Corps of Engineers efforts at Albeni Falls Project.

3. Enhancement in the context of this plan "...is not a new or additional obigation, but a means of fulfilling existing protection end mitigation obligations under the unique circumstances presented by the Columbia River power system. (House of Representatives Rept. 96-976 Part II. 96th Congress, 2nd Session, in a clarification of Power Council responsibilities under the Northwest Power Act). Protection, under this program, refers to fee-title or easement acquisition of private land. in order to protect existing wildlife habitat and associated wildlife populations. Both protection end enhancement projects are credited as mitigation under this program.

4. Page 8, second paragraph: The habitat units should be totaled to allow direct comparison between estimated losses and projected benefits.

4. Incorporated into text.

5. Page 13: Little Mallard Bay and Swan Bay should be identified on the map of Pend Oreille Lake and vicinity because they are proposed mitigation sites. It would be helpful to indicate that the Pend Oreille River section of the lake extends eastward nearly to Sandpoint. It would also be helpful to identify the proposed mitigation sites.

5. Incorporated into text.

6. Page 16, first paragraph: In line 8, replace "During" with 'For the purposes of." In that same sentence, it seems likely that at least some upland acreage was not inundated. Therefore, we recommend revising the sentence to clarify the process that the interagency team went through to determine this. The

6. Incorporated into text.

explanation should reflect the problem caused by the vagaries in early habitat maps. That is, it was not clear in some habitats, especially agriculture, what constituted upland and what was wetland. The team determined that all inundated habitat could have been wetlands to simplify matters and because they believed any upland vegetation that may have been inundated would have been limited in extent and low in habitat value.

7. Page 17, third paragraph and page 18, second paragraph: recommend that references to 'draft' species models be instead referred to as 'modified.'

8. Pages 17-20: Recommend additional detail and background information be provided to add perspective to the selected species.

9. Pages 21-23: Much of this information is repeated from earlier sections of the report. Recommend cross-referencing rather than repeating to minimize redundancy.

10. Page 27, third paragraph: 'The work group supported an estimate..: should be changed to 'The work group estimated...'

11. Pages 26-49, Hydroelectric Impacts: More detailed information and additional references should be provided to describe the estimated impacts and to put them into perspective with the projected present day without project condition.

12. Page 50, first and second paragraphs: References should be provided to document the numbers provided in the text.

13. Page 50, third paragraph: An additional impact from hydropower development ie reduced sediment transport in the Clark Fork River due to the presence of Cabinet Gorge and Noxon Rapids Dams. Reduced sediment transport inhibits the ability of the Clark Fork to renourish itself.

14. Page 50, fourth paragraph and page 51, first paragraph: Yellow warbler should be deleted as it has gained habitat since construction of Albeni Falls Dam.

15. Page 51, second paragraph: Disagree with the statement in the first sentence concerning the opportunity to observe wildlife, particularly in light of the comments made pertinent to bald eagles on pages 19 and 54 and the improved access resulting from recreational development.

16. Page 51, third paragraph: The fact that 1947 and 1953 reports underestimated wildlife losses is partly due to the unforeseen impacts that a l-foot increase in lake elevation would

7. Target species models are no longer described as 'modified' or 'draft.' but simply as models.

8. Incorporated into text, especially in the 'Results and Discussion' section.

9. Some information has been removed. However, some replication is required in this report because interested individuals often review or copy only specific portions of the text.

10. Incorporated into text.

11. Noted.

12. Incorporated into text.

13. Incorporated into text. Also, Lightening Creek supplies a heavy sediment load to the Clark Fork Delta, due to timber harvest and road building activities in its watershed.

14. Incorporated into text.

15. The previously productive wetlands supported a much more diverse wildlife community than the present-day mudflats.

16. The loss of vegetated wetlands in the fluctuation tone resulted primarily from the Change in seasonal water levels. Before Albeni Falls Dam. spring flood waters receded quickly from the

have. Due to the nature of the low-gradient topography around much of the lake, most of the shoreline consists of marshland. Over time, the 1-foot elevation increase has slowly drowned the marshes, resulting, over 35 years, in additional losses.

17. Pages 52-57, Management Goals: More detailed background information and additional references should be provided to explain and justify recommended management goals. In particular, more regional perspective should be added to enable the NPPC to evaluate this plan and the needs of the proposed target species.

18. Page 53, third paragraph: The acronym CWS should be explained and included in Appendix A.

19. Page 55, third paragraph: Reference to coordination with various agencies should include the Corps of Engineers if peregrine reintroductions are contemplated on Corps lands.

20. Page 55, fourth paragraph: Aside from the bald eagle and peregrine falcon already mentioned in this report, if there are any other known threatened, endangered, sensitive, or species of special concern, they should be specifically mentioned. Otherwise, this statement is unnecessary except for species that may become listed in the future.

21. Page 59: Suggest that tables 11, 12, and 13 be placed immediately after this page so that the reader has some perspective on the proposed mitigation package as the various plans are read.

22. Page 60, first paragraph: In line four, insert "existing" between "the" and "easement."

23. Pages 60-89:

a. The preferred mitigation projects should be listed in order of priority with some means of evaluating cost effectiveness of the various plans. A cost per habitat unit, for example, could be used to distinguish low cost, high return plans from high cost, low return alternatives.

b. The level of detail is insufficient to completely understand what is being proposed in the plans. Suggest that maps/drawings be included to show what is being proposed and where it will be located. A matrix of work items and target species would also help show the mitigative efforts proposed.

fluctuation zone during the June to July growing season. The fluctuation zone supported extensive herbaceous and deciduous forested wetlands. After Albeni Falls Dam, Pend Oreille Lake was artificially maintained at a constant high level throughout the growing season, choking out vegetation, and leading to mudflat development.

17. Incorporated into text.

18. Incorporated into text.

19. Incorporated into text.

20. Noted.

21. Noted.

22. Incorporated into text.

23.

a. The preferred mitigation projects are listed in order of priority, as selected by the work group. A cost per Habitat Unit is not always a good way to compare mitigation projects, as many intrinsic benefits are difficult to measure. The total preferred mitigation plan is cost-effective compared to alternatives, including creation of wetlands on-site. The work group prioritized proposals while considering target species benefits, current threats to habitat, unquantifiable benefits, and cost estimates.

b. The time frame of our contract limits the specific details that can be developed. During advance design, more specific details will be addressed.

c. Monitoring should be described in detail, including when it should be performed. The Corps and others conduct some routine monitoring and there is no way to determine if there is any overlap or what areas may be inadequately covered.

d. Similar descriptive text is provided for each plan to describe the costs. Recommend that it be described in detail once and referenced thereafter to minimize redundancy.

24. Page 64, second paragraph: Add to annual operation and maintenance marshland management, including creation of openings and other manipulations.

25. Page 75: It is not clear what is meant by the statement "to the extent affected." Losses and projected benefits should be documented in detail to justify this project. A cost estimate is also needed.

26. Page 80, first paragraph: Suggest adding the first three sentences to the introduction, along with comment # 16.

27. Page 90, first paragraph: In the third line, delete "Corps project" as there are other owners of these lands. In the sixth line, change "possible" to "possibly" and delete "loss of." In line seven add "are lost" to the end of the sentence.

28. Page 90, second paragraph: Suggest adding a sentence regarding upstream dams, such as: "The problem has been exacerbated by construction of dams upstream of the delta on the Clark Fork; the dams impede and minimize sediment transport to the delta, providing little or no opportunity for the delta to rebuild."

29. Page 91, third paragraph: In lines three and four, delete "mid-point of the range of," and add "preliminary" before "costs." In line five, change "$600,000" to "$300,000" and add "proposed for construction on the north fork of the Clark Fork near the delta mouth" to the end of the sentence.

30. Page 91: Change implementation and total costs from "$4,000,000" and "$4,100,000" to "2,000,000" and "2,100,000," respectively. Operation and Maintenance should include costs for major rehabilitation of the breakwater at year 25.

31. Page 94, first paragraph: Recommend the discrepancy between initial 10-year costs and 5-year action plans be reconciled so that both refer to the same time period.

c. Specific monitoring techniques and timing will be described during advance design.

d. Some replication is necessary due to the nature of report review by individuals only interested in certain projects.

24. Incorporated into text.

25. An investigation of wintering redhead distribution, relative abundance, and feeding behavior; aquatic plant distribution and abundance; and methods of increasing redhead habitat quality are needed. Until some data gaps can be filled, specific costs of the project are not possible to determine. "To the extent affected" means the total value of redhead habitat (in terms of HU's) lost due to development and operation of the Albeni Falls hydroelectric project.

26. Incorporated into text.

27. Incorporated into text.

28. Incorporated into text.

29. Incorporated into text.

30. Incorporated into text.

31. Incorporated into text. The five-year action plan has been removed. A general ten-year action plan has been outlined.

32. Page 94, second paragraph: Reference is made to "compared to available alternatives" yet no discussion of alternatives that were considered is provided. This is particularly important for evaluation of the proposed program in order to consider cost effectiveness of proposed alternatives.

32. See "Alternative Mitigation Proposals" section.

33. Table 11: The format for this table makes it extremely difficult to follow and to cross reference to other portions of the report.

33. Noted. This is the format used for amending wildlife mitigation plans into the Columbia River Basin Fish and Wildlife Program.

34. Page 97, second paragraph under "Mitigation Goals": This information is also contained on the next page under the heading "Redhead - wintering." Suggest the paragraph on page 97 be deleted.

34. Noted.

35. Tables 12 and 13: Suggest the acreage included in parentheses be explained in a footnote.

35. Noted.

36. Tables 13 and 14: Refer to comment # 31 above.

36. Incorporated into text.

37. Pages 105-113, Alternative Mitigation Projects: Refer to comment # 23 above. In addition, it is not clear why some of these projects were not listed as preferred when the estimated costs per habitat unit are relatively low compared to some recommended projects.

37. Refer to response to comment 23.a.

38. Page 131: Mr. Ken Brunner attended this meeting and should be included in the list of attendees.

38. Incorporated into text.