WILDLIFE IMPACT ASSESSMENT

ANDERSON RANCH, BLACK CANYON, AND BOISE DIVERSION PROJECTS, IDAHO

FINAL REPORT

BY

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ABSTRACT

Anderson Ranch Project

The Habitat Evaluation Procedure (HEP) was used to evaluate pre- and post-construction habitat conditions of the U.S. Bureau of Reclamation's Anderson Ranch Project in southwestern Idaho. Seven evaluation species were selected with losses expressed in numbers of Habitat Units (HU's). For a given species, one HU is equivalent to one acre of prime habitat. The project resulted in estimated losses of 2,689 HU's of mule deer habitat, 1,197 HU's of mink habitat, 1,048 HU's of mallard habitat, 919 HU's of ruffed grouse habitat, 1,980 HU's of blue grouse habitat, 890 HU's of forested wetland nongame habitat, and 361 HU's of scrub-shrub wetland and deciduous shrubland nongame habitat. The project appears to have affected bald eagles negatlvely, primarily by decreasing prey avallability during winter. The osprey has probably benefited from the project as a result of Increased fish availability during summer.

Black Canyon Project

The HEP was used to evaluate pre- and post-construction habitat conditions of the U.S. Bureau of Reclamation's Black Canyon Project in southwestern Idaho. Seven evaluation species were selected for the Black Canyon area, and five evaluation species were selected for the Deadwood area. The project resulted in estimated losses of 2,322 HU's of mule deer habitat, 1,319 HU's of mink habitat, 270 HU's of mallard habitat, 214 HU's of Canada goose habitat, 260 HU's of ring-necked pheasant habitat, 1,411 HU's of spruce grouse habitat, 68 HU's of forested wetland nongame habitat, 301 HU's of scrub-shrub wetland nongame habitat, and 2,626 HU's of evergreen forest nongame habitat. Bald eagles have been affected negatively,prlmarily by decreased prey avallability during winter.

Boise Diversion Project

The HEP was used to evaluate pre- and post-construction habitat conditions of the U.S. Bureau of Reclamation's Boise Diversion Project near Boise, Idaho. Four evaluation species were selected. The project resulted In estimated losses of 9 HU's of mule deer habitat, 20 HU's of mink habitat, 8 HU's of mallard habitat, and 5 HU's of scrub-shrub wetland nongame habitat. Net effects of the project on bald eagles are unknown because the impacts were not quantified.

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INTRDDUCTION

This report presents an analysis of impacts on wildlife and their habitats as a result of construction and operation of the U.S. Bureau of Reclamation's Anderson Ranch, Black Canyon, and Boise Diversion Projects in Idaho. The study was funded by the Bonneville Power Administration under the authority of Section 1000 of the Columbia River Basin Fish and Wildlife Program adopted by the Northwest Power Planning Council pursuant to Section 4(h) of the Northwest Electric Power Planning and Conservation Act of 1980. The objectives of this study were to:

1. Determine the probable direct impacts of development and operation of the Anderson Ranch, Black Canyon, and Boise Diversion Projects to wildlife and their habitats.

2. Determine the wildlife and habitat impacts directly attributable to hydroelectric development and operation.

3. Briefly identify the current major concerns for wildlife in the vicinities of the hydroelectric projects.

4. Provide for consultation and coordination with interested agencies, tribes, and other entities expressing interest in the project.

To achieve these four objectives, the study was designed to include interested agencies, tribes, and other entities in the assessment. During 1985, field work sessions were conducted for Anderson Ranch from September 25-27, for Black Canyon from September 23-24 and from October 9-11, and for Boise Diversion on October 10 and 15. The purpose of the field work was to evaluate pre- and post-construction wildlife habitat conditions of the project areas. The following agencies participated in all or part of the work sessions: U.S. Bureau of Reclamation (USBR), U.S. Fish and Wildlife Service (USFWS), U.S. Bureau of Land Management (USBLM), U.S. Forest Service (USFS), and Idaho Department of Fish and Game (IDFG). Throughout preparation of the report, consultation and coordination were conducted with the agencies listed above, the Shoshone-Bannock Tribes, the Bonneville Power Administration (BPA), and the Northwest Power Planning Council (NPPC). The information obtained and exchanged during field work sessions, meetings, and report reviews forms the basis of the impact assessments.

ANDERSON RANCH

PROJECT DESCRIPTION

Anderson Ranch Dam is located at approximately mile 37 of the South Fork of the Boise River, about 20 air miles north of Mountain Home, Idaho (Figure 1). The earth-filled structure is 456 feet high and has a total storage capacity of 493,200 acre-feet of water. Two generators operate at a maximum capacity of 40 megawatts (USBR 1981a). At full pool, the reservoir has a surface area of 4,740 acres, is 14.6 miles long, and is one-fourth to one mile wide The reservoir inundated 4,740 acres of habitat, 18.3 miles of river channel, and 6.7 miles of tributaries. In addition, the dam and power plant staging areas covered about 72 acres. The Wildlife Mitigation Status Report (Chancy and Sather-Blair 1985a) for this project stated "... there was no mitigation for losses of wildlife habitats..." resulting from the project.

The Anderson Ranch Project is part of a federal water storage system in the Boise River drainage. It is authorized for irrigation, flood control, power production, fish and wildlife, and recreation (USBR 1981a). Construction of the project was authorized by the Department of the Interior Secretary's Findings of Feasibility, June 25, 1940, under Section 9 of the Reclamation Project Act of 1939 (USBR 1957). The dam was completed in 1950 (USBR 1980).

Prior to 1980, July through September irrigation releases from the reservoir averaged 4,500 cubic feet per second (cfs). In September, releases from the reservoir were generally reduced to 200 cfs. Winter releases varied with power peaking operations and ranged from 200 cfs to 1,600 cfs. Spring flood control releases have reached 5,000 cfs (USBR 1981a). Over the past four years, the USBR has maintained fall and winter minimum flows of 300 cfs and a minimum of 600 cfs the rest of the year. Over the last 10 years, the average annual reservoir drawdown was 62 feet and the largest drawdown was 116 feet.

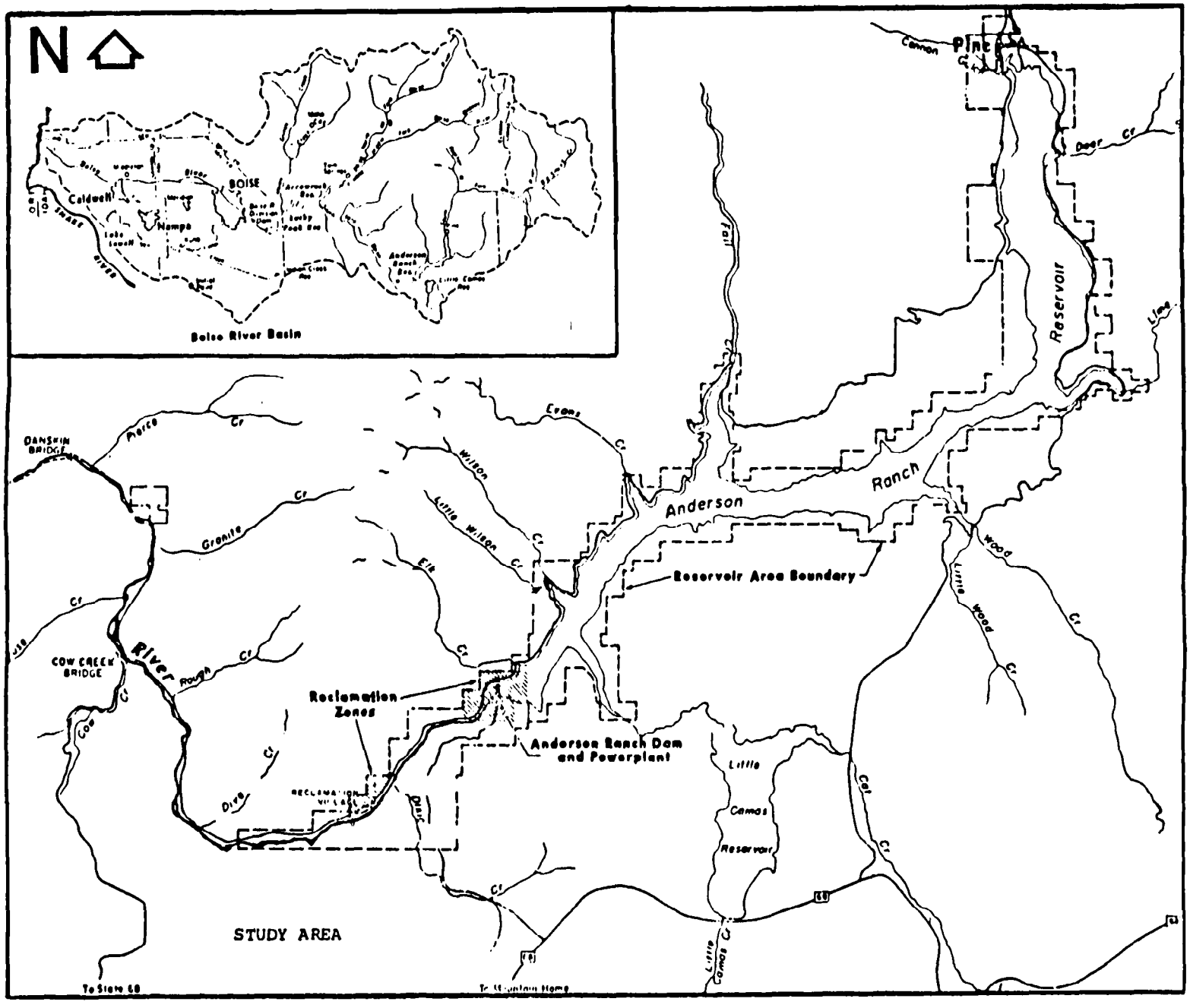

Figure 1. Post-construction map of Anderson Ranch Project and general vicinity.

STUDY AREA

The Anderson Ranch project is located in the Boise River drainage in southwestern Idaho. The Boise River is a tributary of the Snake River and a part of the Columbia River drainage system. The South Fork of the Boise River originates in the Sawtooth Mountains. The total drainage of the South Fork totals approximately 1,300 square miles with about 1,000 square miles located upstream from Anderson Ranch Reservoir (USFWS 1980a). The run-off from the area above the reservoir averages more than 700,000 acre-feet per year, and is about one-third of the 2 million acre-feet of annual Boise River basin run-off, measured at Boise.

The climate of the Boise River watershed is semi-arid with warm, dry summers and cold, wet winters. Annual precipitation at the dam averages about 20 inches, with most occurring as snow in the winter months (USFWS 1980a). At the dam, average deepest snow depths are 12.9 inches while average snow depths are less than 10 inches (Table 1). Summer rainfall averages about 2 inches for June, July, and August combined.

Table 1. Average snow depths (in inches) at Anderson Ranch Dam (1975-1985).

	November	December	January	February	March
Average	1.0	4.6	9.8	9.2	4.6
Standard deviation	0.8	3.6	8.3	9.2	6.4

Average January temperatures at Anderson Ranch Reservoir are about 28°F, while temperatures in July average 74°F (USFWS 1980a). Winter minimum temperatures occasionally fall below 0°F and summer maximums frequently exceed 100°F. Average daily highs in July and August are about 90°F.

For the purpose of this impact assessment, the study area included the Anderson Ranch dam, reservoir, and power plant staging areas, and extended 100 meters from the boundary of the reservoir. The 100 meters adjacent to the reservoir were included in the evaluation to credit the post-construction area with beneficial effects resulting from the project. Waterfowl and aquatic furbearers require terrestrial habitats adjacent to water. An evaluation of post-construction habitat values for these species necessarily must include an area of land adjacent to the reservoirs. Literature supports the assumption that most of the habitat needs of breeding mallards (Bellrose 1976) and aquatic furbearers (Burgess 1978, Melquist et al. 1981), are met within 100 meters of open water. The 100-meter area also includes the area where habitat may have changed as a result of the project. When there are habitat changes, they tend to be from upland communities to wetland communities. For land-related evaluation species (big game, upland birds, nongame), the Habitat Units (HU's.) provided by the 100-meter area in the post-construction evaluation cancel the HU's provided by the 100-meter area in the pre-construction evaluation, except when habitat changes have occurred as a result of the project. When wetland vegetation becomes established in place of pre-construction upland vegetation, the 100-meter area tends to provide

more HU's, and the net losses of the project are reduced. For water-related evaluation species (waterfowl, aquatic furbearers), the 100-meter area is not evaluated under pre-construction conditions except, rarely, when it occurs within 100 meters of the pre-construction river. Again, when portions of the 100-meter area are evaluated under both pre- and post-construction conditions, the HU's cancel if the habitat suitability is unchanged. Usually, the 100-meter area surrounding the reservoirs is evaluated for waterfowl and aquatic furbearers only under post-construction conditions. Therefore, extending the study area 100 meters beyond the reservoir's boundary reduces the net losses of the project.

The effects of flow releases on downstream vegetation are discussed; however, the river corridor downstream from the dam was not included in the study area. The transmission corridor, while part of the hydroelectric facility, was not included because BPA will be negotiating an agreement with the state "... regarding transmission lines and their effect on wildlife and its habitat" (Northwest Power Planning Council 1984). The impacts of recreation facilities and increased human uses that have occurred as a result of the project were not quantified or considered in habitat evaluations because they are not considered direct impacts that can be assessed under the Columbia River Basin Fish and Wildlife Program.

METHODS AND MATERIALS

The Habitat Evaluation Procedure (HEPI developed by the USFWS (198Oc) was used to evaluate the quality of wildlife habitat in the project area under pre- and post-construction conditions. An interagency team of biologists selected eight target species and, for all but the Rocky Mountain elk, evaluated habitat quality based on selected species models. Each of these target species was chosen because it either is of high priority according to state or federal programs, or because it is an indicator species used to describe habitat conditions for other species with similar habitat needs.

Through correspondence and discussions with agencies and the Shoshone-Bannock Tribes, the following target species were agreed upon:

Species	Reason for selection
Mule deer (Odocoileus hemionus)	Indicator big game species.
Rocky Mountain elk (Cervus elaphus)	High priority species.
Mallard (Anas platyrhynchos)	Indicator waterfowl species.
Mink (Mustela vison)	Indicator aquatic furbearer species.
Black-capped chickadee (Parus atricapillus)	Indicator species for wildlife associated with forested wetlands.
Yellow warbler (Dendroica petechia)	Indicator species for wildlife associated with scrub-shrub wetlands.
Ruffed grouse (Bonasa umbellus)	Indicator species for game bird species associated with wetland habitats.
Blue grouse (Dendragapus obscurus)	Indicator species for game bird species associated with upland habitats.

Target species information was obtained from the published and unpublished HEP models and from current and pertinent published literature. Whenever possible, a review of research conducted in Idaho on the target species was Incorporated into the report.

Pre- and post-construction species lists and population information were obtained from published documents describing the Anderson Ranch Project area (USFWS 1950, 1980a; USBR 1978, 1981, 1982; Cadwallader 1980). Additional information was obtained from interviews with wildlife and fishery professionals, local residents, and people who otherwise knew the area before or after inundation.

Vegetation mapping of the pre-construction period was done using 1939 black-and-white aerial photography (scale 1:13,900). Mapping of the post-construction period was done using 1984 black-and-white aerial photography (scale 1:18,000). The national wetland classification system (Cowardin et al. 1979) was used to map the wetland plant communities. Upland cover types were mapped using the classification system of the USFWS (1981).

In order to assess losses and/or gains in wildlife habitats as a result of the Anderson Ranch Project, vegetation communities and land uses were assessed for the study area and vicinity. Vegetation cover type mapping was necessarily general due to the lack of resolution on the black-and-white aerial photographs. The USFWS (1950) pre-construction vegetation mapping and descriptions were helpful for general information. Nine cover types (i.e., plant communities or land use features) were identified using pre- and post-construction aerial photographs:

Deciduous forested wetland.- This wetland type occurs in river bottoms and along tributaries. Woody vegetation is ≥ 20 feet in height. In the study area, these forested wetlands were sub-typed into river bottom forested wetlands and tributary forested wetland. The river bottom forested wetlands were then sub-typed into the extensive forested wetland in the wide area comprising the upper third of the study area, and the relatively narrow bands of forested wetland occurring in the narrower portions of the study area. The river bottom forested wetland is dominated by black cottonwood (Populus trichocarpa), with water birch (Betula occidentalis), alder (Alnus spp.), willows (Salix spp.), red-osier dogwood (Cornus stolonifera), rose (Rosa woodsii), serviceberry (Amelanchier alnifolia), and many other species in the understory. Deciduous trees dominate, but some Ponderosa pines (Pinus ponderosa) are present. The tributary forested wetlands contain similar species, but the sites are generally steeper, occasionally dominated by alder and willow, and have a higher occurrence of quaking aspen (Populus tremuloides), bitter cherry (Prunus emarginata), chokecherry (Prunus virqiniana) ceonothus (Ceonothus spp.), currants (Ribes spp.), spirea (Spiraea spp.) and elderberry (Sambucus spp.).

Deciduous scrub-shrub wetland.-- In this cover type, dominant woody vegetation is < 20 feet in height. These wetlands occurred primarily in the wide area that comprised the upper third of the study area. Willows dominate, with red-osier dogwood, rose, black hawthorn (Crataegus douqlasii) and many other species comprising this type.

Shrub-steppe.- This cover type occurred throughout the study area on slopes. Mountain big sagebrush (Artemisia tridentata vaseyana) tends to dominate on shallower slopes, and antelope bitterbrush (Purshia tridentata) tends to dominate on steeper slopes. Both species are present on all slopes. Other common shrubs include snowberry (Symphoricarpos spp.), serviceberry, and currant. Bluebunch wheatgrass (Agropyron spicatum) is the most common grass, with needle-and-thread (Stipa spp.), basin wild rye (Elymus spp.), and bluegrasses (Poa spp.) commonly occurring.

Evergreen forest.--This type occurred primarily on the north-facing slopes of the south side of the study area. Douglas-fir (Pseudotsuqa menziesii) Is the dominant tree species, with small numbers of ponderosa pine and quaklng aspen. Common shrubs include ninebark (Physccarpus malvaceus), serviceberry, Oregon grape (Berberis repens), and bitter cherry.

Deciduous shrubland.- This type occurred in draws and seeps on slopes of all aspects, and on open hillsides of north aspects on the south side of the study area. This type occurs as dense stands of deciduous shrubs including bitter cherry, chokecherry, rose, ceonothus, serviceberry, snowberry, elderberry, red-osier dogwood, antelope bitterbrush, mountain big sagebrush, and willows. Scattered cottonwoods and quaking aspen also occur.

Agriculture/pasture.- Pastureland or crops (mostly alfalfa) occurred in four areas within the study area.

RIverine rock bottom.- This cover type describes the river channel prior to project construction.

Lacustrine open water.- This type describes the reservoir pool.

Other.-- This type includes the dam and power plant staging areas. Roads were not included here because similar mileages were present in the study area before and after project construction. Road acreages were included in the cover types in which they were located.

Habitat Evaluation Procedure

The black-capped chickadee, yellow warbler, mink, and blue grouse models are published and are available from the USFWS (Schroeder 1982, Schroeder 1983, Allen 1984, Schroeder 1984). The mallard, mule deer, and ruffed grouse models are developed but unpublished (Appendix A). The Rocky Mountain elk was not evaluated with HEP due to the lack of developed models pertinent to this study area. It is assumed that the evaluation for mule deer represents the project's impacts on elk.

With the HEP, each species model uses a number of measurable variables that are combined into an equation which results in a sample site Habitat Suitability Index (HSI). The average HSI from all sample sites is used as the HSI value for a given evaluation species in the study area. This overall HSI is a number between 0 and 1.0. It is a quality index, or a measure of the capacity of the project area to meet the life requisites of the evaluation species.

To evaluate changes in wildlife habitat quality associated with this project using the HEP, two scenarios had to be considered: baseline or pre-construction conditions, and future-with-the-project or post-construction conditions. During informal meetings and the field work session, the interagency team of biologists discussed sampling procedures to determine the HSI's for the evaluation species for both conditions. After a review of available photographs and Information, one important assumption was accepted : the habitat quality of vegetation communities in or near the study area are representative of corresponding vegetation communities inundated by the project.

A number of variables had to be measured for the selected evaluation species models. Distance and interspersion variables were determined using pre- and post-construction aerial photography. Habitat variables such as tree and shrub heights, tree, shrub, and herbaceous canopy cover, and number of snags were measured in the field. The interagency team of biologists spent one day in the study area looking at cover types and selecting sampling locations, then split into two teams for two days to take field measurements. General sampling areas were selected based on their similarity to areas that were inundated by the reservoir or because they were considered representative of vegetation currently in the study area. Three I ine transects of 100 feet each were randomly selected within each sampling area. Vegetation measurements were taken along these transects.

For each evaluation species, the overall HSI was multiplied by the number of acres of habitat for those cover types needed by each species. This yielded the number of Habitat Units (HU's), a measure of quality and quantity of habitat available to the species. For a given evaluation species, one HU is equivalent to one acre of prime habitat. The difference in HU's for each evaluation species between pre- and post-construction periods represents the losses and/or gains of habitat, in terms of quality and quantity, that have resulted from development and operation of the Anderson Ranch Project.

The sampling design for determining HSI's and HU's varied for each evaluation species:

Mule deer.-- All of the cover types in the study area were evaluated as mule deer habitat except riverine, lacustrine, and agriculture/pasture. Field measurements were taken, and HSI's calculated, for a total of 21 locations representing five cover types.

Mallard.-- The evaluation used a combination of aerial photography and field observations made above and below the reservoir. The evaluation team agreed that 100 meters on either side of main water channels should be evaluated as mallard habitat for the pre-construction period. For this analysis, the river channels, tributaries, and islands were evaluated with sample site HSI values calculated at 1.0 mile intervals. The post-construction evaluation assumed that only the top of the reservoir provided mallard habitat suitable for evaluation. Similar to the pre-construction analysis, 100 meters adjacent to the reservoir were evaluated as mallard habitat.

Mink.-- The evaluation used a combination of aerial photography and field measurements to assess mink habitat within 100 meters of waterways, and in wetlands >100 meters from waterways. The pre-construction area evaluated was 18.3 miles of river, 6.7 miles of tributaries, islands, and 163 acres of wetlands >100 meters from waterways. The evaluation used sampling locations spaced every mile along the river and the Lime Creek and Fall Creek tributaries. A sample site HSI was estimated at each of these sites using the aerial photography and appropriate data collected in the field. The post-construction evaluation used field data, 1984 aerial photography, and reservoir operations information. About 45 miles of shoreline were evaluated by estimating sample site HSI's at one-mile intervals.

Black-capped chickadee.-- The evaluation used field data from a total of eight locations to assess the quality of overstory habitat in the forested wetlands.

Yellow warbler.-- The evaluation used field data from a total of five locations to assess the quality of shrub habitat in the scrub-shrub wetland and deciduous shrubland cover types.

Ruffed grouse.-- The evaluation used a combination of aerial photography and field data from five locations in forested wetlands.

Blue grouse.-- The evaluation used a combination of aerial photography and field data from a total of 14 locations in the evergreen forest, deciduous shrubland, and shrub-steppe cover types.

RESULTS

HABITAT AND LAND USES

Pre-construction Conditions

The reservoir inundated 4,740 acres (map located in Appendix B), and the dam and power plant staging areas covered 72 acres (Table 3). Within the 4,812 acres covered, the South Fork of the Boise River flowed through a deep-sided canyon that was relatively narrow and steep through the lower 70 percent of the area, and wider and less sloped through the upper 30 percent. There were 18.3 miles of free-flowing river, and at least 14 islands that supported deciduous vegetation. The islands varied from 0.2 to 89 acres in size, and totaled 100 acres.

The braided river channel in the upper part of the reservoir created extensive areas with island-like characteristics within deciduous wetlands. This upper 30 percent of the study area was gently sloped and up to a mile wide. It contained 67 percent of the forested and scrub-shrub wetland acreage and 44 percent of the distance of the river channel inundated by the project.

In the lower 70 percent of the study area, several tributaries, notably Lime Creek and Fall Creek, flowed into the river. This lower portion of the study area characteristically had a narrow band of forested wetland along the river and tributaries. More extensive wetland acreages occurred at the mouths of tributaries and on the inside bends of the river. The shrub-steppe cover type comprised a majority of the area on the slopes of the north side of this area. The slopes of the south side contained most of the acreages of evergreen forest and deciduous shrubland within the study area. Shrub-steppe vegetation also occurred on the south side on west aspects.

Comparison of the pre-construction cover type acreages in Table 2 with those reported in the early U.S. Fish and Wildlife Service report (USFWS 1950) reveals some discrepancies. The acreage reported was sagebrush, 1909; deciduous broadleaf trees, 1187; conifers, 465; grasses and agriculture, 433; water, 66; sand-gravel, 47; browse, 43; and marsh-swamp, 3. The USFWS (1950) cover types totaled 4,153 acres, 587 acres below the 4,740 acres the reservoir surface comprises. The 1950 report was very general in nature and lacked description of methods used. Therefore, it is felt that the current measurements probably represent a more accurate estimate of cover type areas within the study area.

Land uses prior to construction included livestock grazing, recreation, and fur-trapping. Both cattle and sheep grazed the areas adjacent to the river. Recreational uses included fishing and hunting. Species trapped included mink, muskrat (*Ondatrazibethicus*), and raccoon (*Procyon lotor*).Beavers (*Castor canadensis*) were also present, but the trapping season was closed around 1900 and was not reopened until 1957.

Table 2. Cover type acreages In the Anderson Ranch etudy area[1] for pre- end post-construction conditions.

	Deciduous forested wetland	Deciduous scrub-shrub wet lend	Shrub-steppe	Evergreen forest	Deciduous shrub land	Agriculture/ pasture	Riverine rock bottom	Lacubtrine open water	Other-[2]	Tote t
Pre-constructlon	1,006	258	3,379	675	358	565	275	0	0	6,518
Post-construction	40	2	1,179	395	88	0	0	4,740	72	8,516
Net gain or loss	-966	-256	-2,200	-280	-270	-565	-275	+4,740	+72	

1 Study area extended 100 meters from the edge of the reservoir.

2 Includes dam end power plant staging areas.

Post-construction Conditions

The Anderson Ranch Project created a reservoir of 4,740 surface acres (Table 2). Fluctuating water levels have not allowed vegetation to establish along the shoreline (USBR 1981a). Water fluctuations inhibit the establishment of emergent wetland plant species, as well as other riparian vegetation. Consequently, a denuded shoreline develops. Presently, wetlands exist only above the high-water line of the mouth of the river and tributaries.

The South Fork of the Boise River below Anderson Ranch Dam is also subject to fluctuating water levels. Fluctuations can occur both seasonally and daily. Maximum discharges generally occur in the spring months (Table 3). The annual maximum discharges occurring between 1951 and 1980 ranged from 1,590 cfs to 9,770 cfs. Annual minimum discharges during the same time period ranged from 95 cfs to 325 cfs. Since 1980, the USBR has been maintaining fall and winter minimum flows of 300 cfs and a minimum flow of 600 cfs the rest of the year. Changes in rates of flow released from the dam are generally controlled to minimize impacts on downstream riverine habitat (Woodworth 1986a).

Daily fluctuations have occurred during winter months to meet power peaking demands (January - March 1950-1980) when sufficient water was available. Power peaking operations began as early as October (USFWS 1980) and, generally, ended when high flood control or irrigation releases began. Since 1980, power peaking operations have been virtually nonexistant. According to the USBR, flows downstream from the reservoir are relatively stable for long periods of time. Therefore, impacts to riparian vegetation from daily flow fluctuations are currently nonexistent (Woodworth 1986a).

Table 3. Average post-construction outflows from Anderson Ranch Dam (1951-1985).

Month	Average outflow	
	cfs	std. deviation
January	715	(372)
February	687	(446)
March	661	(571)
April	986	(848)
May	2,209	(1,224)
June	2,565	(1,024)
July	1,481	(323)
August	1,131	(340)
September	745	(436)
October	424	(267)
November	501	(335)
December	700	(366)

The construction and operation of Anderson Ranch Dam has resulted in a decrease in run-off flows downstream from the reservoir during spring (Figure 2). Based on average monthly means, annual maximum flows have decreased 8.7%. The timing of annual maximum flows has also apparently changed. Pre-construction maximum annual flows generally occurred in May, whereas more post-construction maximum flows have occurred in June.

Some negative impacts could be occurring as a result of decreased water fluctuations and sediment recruitment downstream from the reservoir. High annual run-offs are capable of scouring sand and cobble bars, creating seedbeds for cottonwood seedling establishment. Sediments that are generally deposited along a watercourse also help create areas for cottonwood seedling establishment. Ohmart et al. (1977) noted that the cessation of annual overflows and natural channel movements of the Colorado River, as the result of dam construction, has curtailed the formation of seedling habitat for cottonwoods. Altered flows on the lower South Fork of the Boise may favor already established cottonwoods, but may be detrimental to the new establishment of seedlings.

The exact effects of decreased annual fluctuations and sediment recruitment on downstream riparian vegetation are presently unknown and complicated by the actions of other factors. With the current information available, the impacts of the project to downstream vegetation cannot be quantified. In order to determine what impacts have occurred and to what degree, specific studies would have to be implemented to answer those questions.

Post-construction land uses at Anderson Ranch Reservoir include livestock grazing and recreation. Presently, there are five grazing allotments on the reservoir: four cattle and horse allotments and one sheep and goat allotment (Table 4). Lake Creek, Lockman Gulch, and Wood Creek allotments are "on/off" permits. An on/off permit is issued when at least 50% of the land being grazed is private or leased, the remaining percent of land grazed is USFS land, and the landowner agrees to let the USFS manage grazing on his land in exchange for using USFS land.

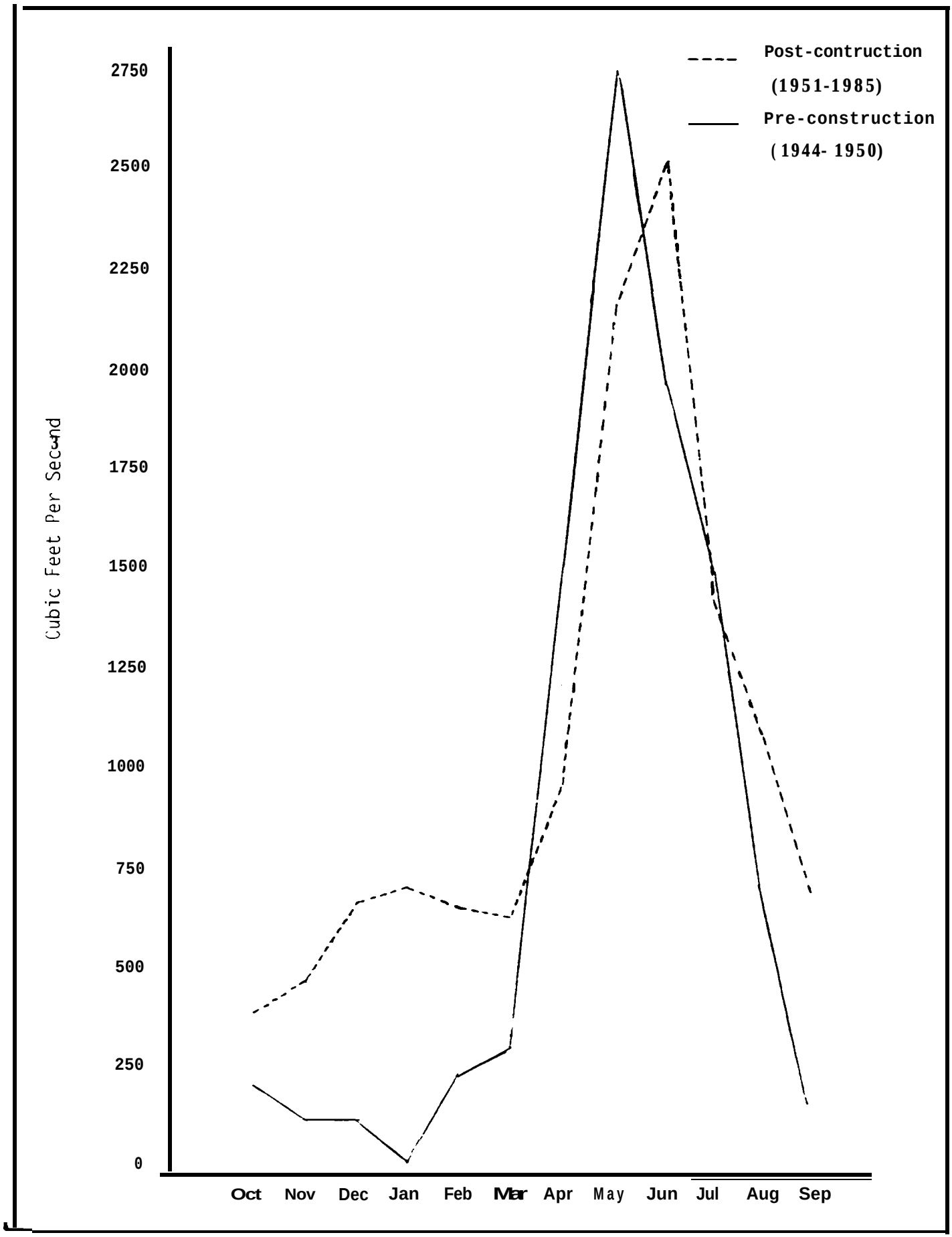

Figure 2. Comparison of pre- and post-construction flows at Anderson Ranch Dam.

Table 4. Grazing at Anderson Ranch Reservoir.

Allotment name	Land ownership	Number of days grazing occurs annually	AUMs[1]	Approx. shoreline within the allotment (miles)
Lake Creek C & H	USFS	114	542	4.0
(Cattle and Horse)	Private	114	568	
House Mountain (S G)	USFS	143	1,700	3.6
(Sheep and Goat)	Private	10	110	
Dixie C & H	USFS	122	1,106	5.2
	Private	137	521	
Lockman Gulch C & H	USFS	137	24	1.8
	Private	137	689	
Wood Creek C & H	USFS	168	311	9.9
	Private	168	6,947	

Anderson Ranch is one of three large reservoirs on the Boise River. Most of the people who use the reservoir for recreation are from Boise, Mountain Home, Magic Valley, and Wood River Valley (L. Munson, USFS, pers. commun.). Recreational uses include fishing, hunting, camping, and water skiing.

Presently, recreation facilities are oriented toward boating activities and camping. Facilities include seven boat launching ramps, four primitive campsites, boat docks, picnic tables, and toilets. The USFS manages and operates public facilities and administers the Special Use Fermit for private recreation developments surrounding the reservoir, such as Fall Creek Lodge. Private facilities include Deer Creek Lodge and summer or year-round cabins.

Recreational use at Anderson Ranch Reservoir has increased dramatically over the last ten years (L. Munson, USFS, pers. commun.). On the average, recreational use has increased 3% annually (R. Entwistle, USFS, pers. commun.). In 1975, the USBR (1981a) reported that recreational demands were expected to double by the year 2000. Part of the projected growth will be attributed to second home developments near Pine. However, most of the recreational growth will be caused by population increases in Ada and Canyon counties, which presently contain the largest population concentration in Idaho (USBR 1981a).

1 One AUM is the amount of forage needed to sustain one cow or five sheep for one month.

THREATENED AND ENDANGERED WILDLIFE SPECIES

Endangered wildlife species listed by the Department of Interior and occurring in the project area include the bald eagle (Haliaeetus leucocephalus) and gray wolf (Canis lupus). Bald eagles are generally observed at Anderson Ranch Reservoir during late fall and/or winter. The most recent wolf sighting occurred in 1978, on the road between Lester Creek and Ice Springs Campground north of Anderson Ranch Reservoir (Idaho Natural Heritage Program (INHP), unpubl. data). The South Fork of the Boise River is within the general range of the American peregrine falcon (Falco peregrinus anatum), but no recent sightings have been made (USFWS 1980a).

The following species are listed as "Candidate Species--Category 2"[2] under the Endangered Species Act and have been observed in the Anderson Ranch area: Swainson's hawk (Buteo swainsoni) ferruginous hawk (Buteo regalis), and North American wolverine (Gulo gulo luscus). Both Swainson's and ferruginous hawks have been sighted near the reservoir during a 1978-1980 bird survey (Cadwallader 1980). The most recent wolverine sighting occurred in 1983 along the South Fork of the Boise River, downstream from Anderson Ranch Dam, between Cow Creek and Granite Creek (INHP, unpubl. data).

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2 Candidate Species--Category 2: "Comprises taxa for which information now in possession of the Service indicates that proposing to list the species as Endangered or Threatened is possibly appropriate but for which substantial data are not currently available to biologically support a proposed rule" (USFWS 1982).

BIG GAME

Introduction

Four big game species are present. Black bears (Ursus americanus) are associated with evergreen forests throughout Idaho. Rocky Mountain elk are associated with both forested and sagebrush habitats. Mule deer are associated with forests and sagebrush areas (Appendix C), and mountain lions (Felis concolor) are restricted largely to the habitat of deer, their primary prey (Dixon 1982).

A mule deer model was selected to estimate the effects of the project on big game habitat. The mule deer was chosen as the evaluation species because of its relative importance, and its association with sagebrush habitats. The habitat components measured for the model are also important to elk and mountain lion,as well as other sagebrush-associated species (e.g., chukar, sage thrasher).

The model uses winter food and cover values to evaluate the ability of the habitat to support mule deer. The winter food value is based on the canopy cover of total browse and preferred browse present, as well as the canopy cover of grasses and forbs present. Cover value is based on canopy cover of evergreen, woody vegetation $\geq$ 10 feet in height, and topographic diversity represented in the study area.

Pre-construction Conditions

Mule deer and Rocky Mountain elk were the major big game species present in the study area prior to inundation. The area provided "... extremely important winter range . .." for these species, especially at the upper end of the impoundment (USFWS 1950). In addition, the area provided "... important fawning grounds for deer" (USFWS 1950). Early reports describing the South Fork of the Boise River prior to the project did not mentior. other big game species; however, black bears and mountain lions were undoubtedly present.

The USFS currently identifies the land on the north and east sides of the reservoir as deer and elk winter range. Much of the south side is identified as elk winter range. Additional evidence supporting the importance of the study area to mule deer is provided by the large numbers of deer that presently winter in the river corridor below Anderson Ranch Dam.

If it is assumed that current habitat conditions in areas near the reservoir are similar to conditions In areas that were inundated, then the habitat quality was excellent. The shrub-steppe, deciduous shrubland, forested wetland, scrub-shrub wetland, and evergreen forest cover types provided abundant food for herbivores. The conifers on the north-facing slopes provided optimal thermal cover for wintering big game. Forested wetlands along the river provided thermal cover to a lesser degree. Also, the area inundated provided optimal interspersion of cover types. It was assumed the entire study area was available to mule deer and all big game during winter because the average annual deepest snow depth measured at Anderson Ranch Dam from 1963 to 1985 was 12.9 inches, about half the depth Loveless (1967) reported would preclude mule deer use of areas.

For this habitat evaluation, it was assumed that al l of the cover types except agriculture/pasture and riverine were used by mule deer during some portion of the year. This amounted to 5,676 acres of the study area. A food suitability index of 0.69 and a winter cover index of 1.0 were calculated us ing the HEP model. As a resul t, the overall HSI value for mule deer in the study area prior to construction was 0.69. Therefore, based on model calculations,the study area had an estimated 3,916 HU's (Habitat Units) prior to project construction. This HU value can be interpreted to mean that the 5,676 acres of mule deer habitat that were in the study area prior to construction were equivalent to 3,916 acres of prime mule deer habitat.

Post-construction Conditions

As mentioned in the preconstruction section,the USFS currently identifies the I and on the north and east sides of the reservolr as deer and elk winter range and identifies much of the south side as elk winter range. The area adjacent to the reservoir is important to wintering elk. About 100 to 150 elk winter on the west side of the upper reservoir between Badger Creek and Towne Creek (C. Kvale, IDFG, pers. commun.).

The river corridor directly downstream from the dam supports both resident and wintering mule deer and limited numbers of elk. Higher numbers of deer use the area during severe winters. During the severe winter of 1982-1983, the IDFG counted 679 deer along the road between Danskin Bridge and Cow Creek Bridge, a distance of 3.7 miles. During the mild winter of 1985-1986, 234 mule deer were counted along the same stretch of road. During the 1979 survey, IDFG counted a total of 2,317 deer and 17 elk from the tailwaters of Anderson Ranch Reservoir to the tailwaters of Arrowrock Reservoir (USFWS 1980a).

The study area presently contains 1,704 acres of mule deer habitat. Using the model, an HSI of 0.72 was calculated. Therefore, the study area currently prov ides an estimated 1,227 HU's of mule deer habitat.

Impact Assessment

It was estimated that the study area contained 5,676 acres of big game habitat prior to project construction, while it presently contains 1,704 acres. The following impacts in terms of mule deer habitat were estimated:

Mul e Deer HU's	
3,916	Pre-construction
1,227	Post-construction
-2,689	Change in mule HU's

HU's from habitat loss estimate is al so considered representative for Rocky Mountai n elk in

Another project-related impact is the annual loss of mule deer that die trying to cross the ice on the reservoir. Losses range from one or two to over 30, depending upon whether the reservoir freezes while large numbers of deer are migrating; the average annual loss is estimated to be 6 deer (L. Smith, IDFG, pers. commun.).

FURBEARERS

Introduction

Several furbearer species occupy the area surrounding the Anderson Ranch Project (Appendix D). Pre- and post-construction estimates for these species are non-existent. A mink model (Allen 1984) was selected to evaluate and quantify the effects of the project on aquatic furbearer habitat. The model was developed specifically for mink; however, habitat components measured for the model are important to muskrat, beaver, and river otter (*Lutra canadensis*).

Pre-construction Conditions

The principal furbearer species present, prior to dam construction, were muskrat, beaver, and mink. In addition, raccoons, skunks, and river otters were present, but in fewer numbers (USFWS 1950). Bobcats (*Felis rufus*) were not mentioned in the USFWS (1950) report, but were undoubtedly also present.

Prior to inundation, riparian and aquatic habitats along the South Fork and its tributaries provided suitable aquatic furbearer habitat. Cottonwood and willow species were present, providing food for beavers. Some marsh-swamp areas existed, and probably provided muskrats with preferred foods, such as cattails (*Typha* spp.), bullrush (*Scirpus* spp.), arrowhead (*Sagittaria* spp.), and clover (*Trifolium* spp.). Small mammals, reptiles, and amphibians associated with riparian habitats provided prey for mink, raccoons, skunks, and bobcats; and the river itself provided native fish for river otters, as well as for mink and raccoons.

The area in which mink were evaluated included 275 acres of river and 1,944 acres adjacent to 18.3 miles of river and 6.7 miles of tributary streams. An additional 163 acres of wetlands farther than 100 meters from the river, and within the study area, were also evaluated.

Generally, the study area provided excellent habitat for mink prior to construction. An estimated HSI of 0.80 for pre-construction conditions indicates the study area provided 1,905 HU's for mink.

Post-construction Conditions

The reservoir eliminated 18.3 miles of river and 6.7 miles of tributaries where several furbearer species resided. Now, beaver and muskrat activities are limited to the river below the dam and its tributaries (USBR 1982). Other furbearer species such as the river otter, raccoon, and mink were also adversely affected.

The reservoir currently provides 45.5 miles of shoreline that may be used by mink. The 62-foot average seasonal drawdown of the reservoir results in large expanses of reservoir bottom being exposed, especially at the upper end. As a result of the operational characteristics of the reservoir, it presently provides limited habitat for mink and other aquatic furbearers. Using the mink model for lacustrine systems, an HSI value of 0.41 was

calculated for 1,727 acres of potential habitat along the shoreline. Therefore, there are an estlmated 708 HU's for mink available In the study area.

Impact Assessment

It was estlmated that the study area contained 2,382 acres of aquatic furbearer habitat along the river, tributaries, and wetlands prior to construction, while the reservoir currently has 1,727 acres of shoreline habitat. Using the mink model, quality of habltat along the river and its tributaries was found to be high, while the reservoir currently provlides poor habitat. As a result, the following change In HU's was calculated:

Mink HU's

1,905	Pre-construction
708	Post-construction
-1,197	Change in mink HU's

An estlmated loss of 1,197 HU's for mink occurred as a result of the project. Due to an average annual drawdown of 62 feet and complete loss of 25 miles of riverine habitat, this loss Is considered an underestimate for beaver, muskrat, and river otter.

WATERFOWL

Introduction

At least 20 species of waterfowl occur In the Anderson Ranch Reservoir area or directly downstream (Appendix D). Pre- and post-construction population estlmates for these species are non-existant. A mallard model (Appendix A) was used to evaluate and quantify the effects of the dam and reservoir on waterfowl habitat.

Pre-construction Condltions

Forested and scrub-shrub wetlands occurring along the river provided moderate quality nesting and brood-rearing habitat for ducks. The pre-project aerial photographs Indicate that the South Fork consisted of braided channels through the upper third of the study area. This area undoubtedly provided good shallow-water feeding areas as well as suitable nesting sites for mallards, teal, and mergansers. The river also provided resting and feeding areas for mlgrating waterfowl.

A 100-meter band along the shorelines of the river and larger tributaries, as well as the islands in the river, were evaluated as waterfowl habitat. This delineation assumed that most of the habitat needs of waterfowl occur close to water. Published data on nest site locations for the mallard generally substantiate the 100-meter boundary (Bellrose 1976). The mallard model was used to evaluate food availability, shoreline cover, and wetland intersperslon within this area.

The pre-construction study area had an estimated HSI value of 0.48 for 2,283 acres of suitable waterfowl habitat. These values Indicate the study area provided 1,096 HU's for waterfowl prior to project construction.

Post-construction Conditions

The reservolr currently has a small number of breeding mallards, green-winged teal, common mergansers, American wigeon, and gadwalls nesting near or adjacent to the shoreline. The reservoir provides 45 miles of shorel ine as potential breeding habitat. However, the annual drawdown inhibits establishment of wetland vegetatlon. Presently, wetland vegetation occurs only at the uppermost end of the reservolr and along the tributaries, extending as far down as the high water line on the reservolr. The reservolr also provides a resting area for migrating waterfowl. Ice conditions reduce the reservoir's resting value during winter.

The selected model assumes that mallards require open water with proximate wetland vegetation for summer nesting and brood-rearlng habitat. Therefore, only the uppermost portion of the reservoir was evaluated as post-construction waterfowl habitat. The evaluation indicated that 56 acres of waterfowl habitat provlde an HSI of 0.85 and 48 HU's for the mallard.

Impact Assessment

The study area provided an estimated 2,283 acres of suitable waterfowl habitat along the river and Its tributarles, while the reservoir currently provldes only 56 acres of suitable habltat. As a result, the followlng impacts were estimated using the mallard model:

Mal lard HU's	
1,096	Pre-construction
48	Post-construction
-1,048	Change in mallard HU's

The project resulted in an estimated loss of 1,048 HU's for mallards. Thls is considered representative for other breeding waterfowl.

UPLAND GAME BIRDS

Introduction

Many upland game bird species are present near Anderson Ranch Reservoir (Appendix D). Pre- and post-construction population estimates for these species are not available. Introduced species include chukar (Alectoris chukar), gray partridge (Perdix perdix), and California quail (Callipepla californica). The chukar was first introduced into Idaho in 1933. First chukar releases in Elmore county were in 1951 (IDFG 1952). A total of 1,200 birds were released in 1951 and an additional 164 birds were released in 1954 (IDFG 1954). The gray partridge moved into Idaho from Washington and Oregon sometime between 1912-1920 (Caldwell and Wells 1974). Introductions occurred in those states about 1900. Mountain quail (Oreortyx pictus) may or may not be native to western Idaho (Ormiston 1966, Johnsgard 1973). Mountain quail are native to eastern Oregon and their historical distribution may have included central and southwestern Idaho (Rybarczyk and Connelly, in press). The other upland game birds species are native to Idaho.

Blue grouse and ruffed grouse are considered to be the most abundant game birds in the study area. The blue grouse (Schroeder 1984) and ruffed grouse (Appendix A) models were selected to evaluate and quantify the effects of the project on upland game bird habitats. The ruffed grouse model evaluates factors such as tree density, height of trees, herbaceous canopy cover, distance to openings, distance to shrubland, distance to conifers, and presence of preferred winter foods. The blue grouse model evaluates shrub canopy cover, height of shrub canopy, herbaceous canopy cover, height of herbaceous canopy during summer, diversity of herbaceous species, distance to conifers, and percent canopy cover of evergreen and aspen trees over the study area. Habitat components measured for the models are also important to other upland game bird species.

Pre-construction Conditions

Upland game bird species present in the area inundated by the reservoir included ruffed grouse, blue grouse, sage grouse, mountain quail, mourning dove (USFWS 1950), and gray partridge. Wetlands along the river and its tributaries provided habitat for most game bird species. Quaking aspen, used by ruffed grouse (Appendix C), were present in draws and seep areas. Mixed deciduous-coniferous growth and understory, used by quail and most grouse species, were present in wetland communities. Side-slopes above the South Fork, dominated by mountain big sagebrush and grasses, provided suitable habitat for sage grouse and blue grouse.

Prior to project construction, the study area provided 1,006 acres of forested wetlands that were evaluated for the ruffed grouse. An overall HSI of 0.95 was calculated using the model. Therefore, the study area provided an estimated 956 HU's of ruffed grouse habitat.

Prior to project construction, the study area provided 4,412 acres of evergreen forest, deciduous shrubland, and shrub-steppe that were evaluated for blue grouse. An overall HSI of 0.72 was calculated using the model. Therefore, the study area provided an estimated 3,177 HU's of blue grouse habitat.

Post-construction Conditions

The project inundated 3,716 acres of game bird habitats within the study area. Currently, chukar and gray partridge are the most abundant game bird species In the area (USFWS 1980a), but several other species are present. Both chukar and gray partridge occur on sagebrush-dominated slopes near the reservolr. Blue grouse are most numerous In the areas with conifers nearby (Append ix C). Mountain quail exist In very limited numbers and are restricted to riparian areas along the South Fork and its tributaries below the reservolr. Sage grouse occur In very limited numbers withln sagebrush habitat (USFWS 1980a).

The project inundated all but 40 acres of the forested wetlands in the study area. Using the ruffed grouse model, an HSI of 0.93 was calculated. Therefore, the wetlands within the study area are presently provlding an estimated 37 HU's of ruffed grouse habitat.

The project presently provides 1,662 acres of evergreen forest, deciduous shrubland and shrub-steppe habitats that were evaluated with the blue grouse model. The calculated HSI was 0.72. Therefore, the uplands within the study area are presently providing an estimated 1,197 HU's of blue grouse habitat.

Impact Assessment

The forested wetlands within the study area provided an estimated 1,006 acres of ruffed grouse habitat, while the study area presently provlides only 40 acres. The upland habitats provlded an estimated 4,412 acres of blue grouse habitat, and presently provide 1,662 acres. Using the HSI values calculated with the models, the project resulted in an estimated loss of 919 HU's for game bird species associated with forested wetland habitats and 1,980 HU's for game bird species associated with upland habitats (Table 5).

Table 5. HU's for game bird evaluatlon species for pre- and post-construction conditions.

	Forested wetlands	Upland habitats
	Ruffed grouse	B I ue grouse
Pre-construction	956	3,177
Post-construction	37	1,197
Change In HU's	-919	-1,980

NONGAME WILDLIFE

Introduction

There are many nongame bird species present in the Anderson Ranch project area (Appendix D). Nongame species represent a large and integral part of the biotic community. They are important ecologically as primary and secondary consumers and as prey items for larger predators (skunks, coyotes, bobcats, bald eagles, etc.). They are also important socially and economically because of the ever-increasing public awareness and appreciation of their existence.

Many wildlife species are dependent upon, or prefer, riparian zones. Thomas et al. (1979) found that riparian habitats were the most critical to wildlife in the Blue Mountains of Washington and Oregon. About 75% of the species present were either directly dependent on or used riparian communities more than any other community. Along the Snake and Columbia rivers, species diversity was higher in riparian habitats, compared to upland plant communities, for birds, small mammals, reptiles, and amphibians (Asherin and Claar 1976). Near the study area, more species of birds were observed in riparian transects than shrub-steppe transects (Cadwallader 1980).

The number of nongame species potentially affected were too large to evaluate each species individually. Two models were selected to evaluate the loss of habitat for those species using similar cover types. These models assess pre- and post-construction habitat conditions for forested wetlands, scrub-shrub wetlands, and deciduous shrublands.

The black-capped chickadee model was selected to represent wildlife species associated with forested wetland habitats such as cavity nesters, some species of flycatchers and warblers, and raccoons. The yellow warbler model was selected to represent wildlife species associated with scrub-shrub wetlands and deciduous shrublands. The models assess habitat components important to a wide variety of mammals, birds, reptiles, and amphibians.

Pre-construction Conditions

Early accounts of the wildlife present on the South Fork prior to dam construction do not mention many nongame species. Composition of the nongame wildlife community can be inferred by examining post-construction inventories of the river directly downstream of the dam. Cadwallader (1980a) reported eighty-one bird species occurring in the South Fork corridor. Wading shore birds, great blue herons, and greater sandhill cranes frequent riparian and wet meadow areas along the river below the reservoir between Rock and Trail Creek in early spring (USFWS 1980a). A few breeding pairs and small groups of non-breeding sandhill cranes also occur on Dixie Creek a few miles south of Anderson Ranch Dam, and on Little Camas Creek above Little Camas Reservoir. Numerous nongame birds nest along the river, and many more rest and feed there during migration (USFWS 1980). In addition, many small mammals, reptiles, amphibians, and their predators use wetland areas along the South Fork River corridor.

The study area had 1,006 acres of forested wetland. Some of the wetlands were long, narrow strips along the river and tributarles, while others were in large wetland complexes. Large black cottonwood trees dominated the overstory, with heights usually In excess of 40 feet. The black-capped chickadee model was used to evaluate the quality of forested wetlands in terms of tree height, tree canopy closure, and number of snags. Using the model, the habitat quality of the forested wetlands was high, with an HSI of 0.92. Thus, there were an estlmated 926 HU's of black-capped chickadee habitat provlded by the pre-construction study area.

The yellow warbler model was used to describe the quality of shrub habitats in terms of shrub height, canopy closure, and percent of shrubs that are hydrophytes. The study area had 258 acres of scrub-shrub wetlands. Most of these wet I ands are domlnated by w i I lows, with other species of secondary Importance. The scrub-shrub wetlands that were sampled provided nearly optimal habitat. Sampl ing resulted in an estimated HSI of 0.96 for the yellow warbler in scrub-shrub wetlands.

The study area had 358 acres of deciduous shrubland. Although wetlands are preferred by yellow warblers, upland deciduous shrub communities are also used (Schroeder 1982). These non-wetland habitats are less suitable for yellow warblers, and the model accounts for thls fact. Samp I ing resu I ted In an estimated HSI of 0.42 for the yellow warbler in deciduous shrublands.

The overall HSI for the yellow warbler in the study area was 0.65 for 616 acres of scrub-shrub wetlands and deciduous shrublands. Therefore, prior to project construction, the study area provided an estimated 400 HU's of yellow warbler habitat.

Post-construction Conditions

The project inundated over 4,800 acres of nongame wildlife habitat. The most significant losses occurred to those species associated with riparian communities and riverine habitats. Nearly all of the forested and scrub-shrub wetlands In the study area were inundated by the project. Those that remain are located at the uppermost end of the reservoir and In the tributary drainages just above the reservoir pool.

The study area presently provides 40 acres of forested wetland, 2 acres of scrub-shrub wetland, and 88 acres of upland deciduous shrubland. The forested wetlands were calculated to provide an HSI of 0.89 and 36 HU's of black-capped chickadee habitat. The scrub-shrub wetlands provlde a calculated HSI of 0.96, and the upland deciduous shrubland was calculated to provlde an HSI of 0.42, for a total estimate of 39 HU's of yellow warbler habitat presently in the study area.

Impact Assessment

Although over 4,800 acres of nongame habitats were Inundated by the project, impacts to nongame species were estlmated only for wetland cover types and the upland deciduous shrubland cover type. The study area had an estimated 1,006 acres of forested wetland, 258 acres of scrub-shrub wetland, and 358 acres of deciduous shrublands. Presently, the study area has 40 acres of forested wetland, 2 acres of scrub-shrub wetland, and 88 acres of deciduous shrubland. The project resulted in estimated losses of 890 HU's for nongame species dependent on forested wetlands, and 361 HU's for species dependent on scrub-shrub wetlands and deciduous shrublands (Table 6).

Table 6. HU's for nongame evaluation species for pre- and post-constructlon cond It ions.

	Forested wetlands	Scrub-shrub wetlands and deciduous shrubland
	Black-capped chickadee	Yellow warbler
Pre-construction	926	400
Post-construction	36	39
Change In HU's	-890	-36 1

RAPTORS

Introduction

At least 19 species of raptors occur within the project area (Appendix D). Pre- and post-construction population estimates are not available. Species summering In the area include osprey, turkey vulture, Swainson's hawk, merlin, and, possibly, bald eagle. The merlin (Falco columbarius) has also been sighted In the area during late August. Wintering species include the rough-legged hawk and bald eagle. Year-round residents include the Cooper's hawk, sharp-shinned hawk, northern goshawk, red-tailed hawk, golden eagle, American kestrel, prairie falcon, northern harrier, common barn-owl, northern pygmy-owl, great horned owl (Cadwallader 1980) long-eared owl (Woodworth 1986a), and northern saw-whet owl.

Species of special interest are the bald eagle, osprey (Pandion hallaetus), Swainson's hawk, ferruglnous hawk, and merlin. The bald eagle is federally listed as an endangered species. Swainson's and ferruginous hawks are candidates for federal status of threatened or endangered. "Species of special concern"[3] or "sensitive specles"[4] are the bald eagle, ferruglnous hawk, and merl in.

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3 Species of special concern: used by the Idaho Department of Fish and Game to Identify species with restricted ranges, specific habitat requ i rements, and/or low numbers which make them vulnerable to eliminations from the state.

4 Sensitive species: defined by the U.S. Bureau of Land Management as species of wildlife in Idaho whose populations are consistently small and widely dlspersed or whose ranges are restricted to a few localities such that any appreciable reduction In numbers, habitat availability, or habitat conditions might severely affect their status.

Pre-construction Conditions

The USFWS (1950, describing the Anderson Ranch area prior to inundation made no mention of specific raptors present. There are, however, historical accounts of raptors in Idaho prior to dam constructlon (Table 7). During the spring of 1806, Lewis and Clark reported seeing juvenile bald eagles In Idaho (Jollie 1953). Bald eagles were observed In the Boise River area as early as the 1880's (Green 1978). Since the 1880's, reports of wintering bald eagles in Idaho have been common, but reports of breedlng eagles are rare (Snow 1973). There are accounts of breeding ospreys in northern Idaho as early as 1887, and in southern Idaho as early as 1930 (Garrison 1930).

Forested wetlands provided good bald eagle wintering habitat and possible nestlng habitat prior to inundation. The river supported trout (Salmo spp.) (USFWS 1950), as well as mountain whitefish (Prosopium wlllamsoni), large-scale sucker (Catostomus macrochellus , mountain sucker (Catostomus platyrhynchus), bridgelip sucker (Catostomus columbianus), longnose dace (Rhinicthys cataractae), and northern squawflsh (Ptychocheilus oregonensis) (B. Bel I , IDFG, pers. commun.). These provided bald eagles with a potentially abundant food supply.

Based on historical accounts, parts of the South Fork of the Boise River remained ice-free durlng the winter (O. Deckard, furtrapper, pers. commun.). Open water provides access to the fish. Waterfowl using the river, and deer and elk carrlon, provided eagles with additional wlnter food sources (USFWS 1950).

Most of the raptor species present prior to dam constructlon used the rlparlan habitat adjacent to the river and Its tributaries. Rlparian habitats generally support higher prey densities than surrounding habitats (Asherin and Claar 1976, Thomas et al. 1979, Cadwallader 1980).

Post-constructlon Conditions

Cadwallader (1980) conducted a two-year raptor survey near Anderson Ranch Reservoir. Numerous raptors occur on the river and surrounding area below the dam. Twenty-eight bald eagles have been sighted on the river from November to April (USFWS 1980a). Wintering birds feed primarily on small mammals and mule deer winterkills.

Bald eagle mid-winter surveys were conducted in 1978-1984 (Appendlx E). The surveys are confined to predeslgnated dates (January 2-16). The 1978-1980 counts did not include the reservoir or the river upstream of the reservolr. There appears to be more bald eagles using the river directly downstream from the reservoir.

Anderson Ranch Reservoir may serve only as a staging area for primarily immature bald eagles during migration. In the fall and wlnter of 1985-1986, more immature bald eagles were seen at the reservoir during late fall than durlng the "mid-winter survey." Nine immature eagles were observed south of Deer Creek in late October (Carson 1985). Ten immature eagles and four adults were seen at the Deer Creek boat ramp In November. Only 3 immature eagles were accounted for In January, during the mid-winter survey (Carson 1986).

Table 7. Raptor species present in Idaho prior to Anderson Ranch Dam construction.

Species	Seasonal Use	Source of Information
Bald eagle	Uncommon resident	Snow 1973
Osprey	Uncommon breeding bird	Garrison 1930
Turkey vulture	Common resident in southern Idaho	Avery 1947
Northern harrier	Common resident	Avery 1947, Batch 1930
Prairie falcon	Fairly common resident	Avery 1947
American kestrel	Common resident	Avery 1947, Davidson 1932, Garrison 1930, Balch 1930
Great horned owl	Common resident	Avery 1947, Twin Falls Times 1930
Northern goshawk	Fairly common resident,	Avery 1947, Twin Falls Times 1930
Rough-legged hawk	Fairly common migrant, possible resident, wintering bird	Davidson 1932, Garrison 1930, Avery 1947, Twin Falls Times 1930
Golden eagle	Uncommon resident	Garrison 1930, Twin Falls Times 1930
Sharp-shinned hawk	Common resident	Avery 1947, Garrison 1930, Davidson 1932
Cooper's hawk	Common resident	Avery 1947, Davidson 1932, Garrison 1930
Ferrugtnous hawk	Uncommon resident	Avery 1947, Garrison 1930
Swainson's hawk	Common breeding bird	Avery 1947, Garrison 1930
Merlin	Uncommon resident	Avery 1947, Garrison 1930.
Red-tailed hawk	Common resident	Avery 1947, Garrison 1930
Common barn-owl	Uncommon resident	Avery 1947
Northern pygmy-owl	Fairly common resident	Avery 1947

The entire reservoir generally does not ice over completely every winter (J. Hansen, USBR, pers. commun.); however, the section from Fall Creek to Curlew Creek launch ramp usually freezes.
reservoir remains open (L. Smith, IDFG, pers. commun.). Iced-over areas make the fish food source inaccessible, and may displace eagles to areas where

Bald eagles may nest near the reservoir. A possible pair of breeding bald eagles were udentufied during the summer of 1985, but the nest has not been located (Howard 1985).

Numerous pairs of ospreys also nest near the reservoir. A. Perry (IDFG, pers. commun.) observed 10 pairs of ospreys durlng the summer of 1985. Nine pairs used the delta area directly north of the reservoir on the South Fork, near Plne Bridge. The other pair was near Trinity Creek upstream of the reservoir, near Featherville. R. Howard (USFWS, pers. commun.) observed six active nests also durlng the summer of 1985. One pair nested about one mile below the dam on a ponderosa plne. Three pairs were just south of the Pine Bridge near the upper end of the reservoir,
the northwest side of the reservoir.

Impact Assessment

Potential food sources for both bald eagles and ospreys were affected by the project. Beneficial impacts include the introductions of kokanee (Oncorhynchus nerka kennerlyi) and smallmouth bass (Micropterus dolomieui). Kokanee were introduced in 1948, and are presently abundant and self-sustainlng. Smallmouth bass were introduced In 1972 and are also reproducing successfully (USFWS 1980a).

Wintering bald eagles may have been benefited by the increased mule deer mortality as the result of ice conditions on the reservoir. About six deer die annually by falling on the ice while trying to cross the reservolr (L. Smith, IDFG, pers. commun.). These dead animals provide food for wintering bald eagles.

Successful management efforts to enhance the fishery downstream from the dam have been beneficial to wintering bald eagles. Recently, increased minimum flows and controlled flow reduction rates by the USBR, and intensive fishery management by the IDFG, have enhanced the fishery below Anderson Ranch Dam. Fish are an important food source for wintering bald eagles. Therefore, the wintering bald eagle habitat below the reservoir has been improved by increasing the fishery In that section of the river.

Negative impacts to bald eagle and osprey food sources also occurred as a result of the project. Mountain whitefish, an important food source, were eliminated from the section of river inundated by the reservoir. Mountain whiteflsh are currently restricted to the river above and below the project.

Overall, the project probably adversely affected bald eagles. Inundation eliminated 18.3 miles of free-flowing river channel. This portion of the river remained open each winter (O. Deckard, pers. commun.), providing access

to the native fishery. Presently, major portions of the reservoir freeze, preventing access. Open water Is an Important requirement of winter bald eagles (Appendix C). Fish become inaccessible when the reservoir freezes. Iced-over conditions also decrease the amount of resting and feeding habitat for waterfowl, another important food source for wintering bald eagles (Appendix C). The loss of open-water habitat as a result of the project negatively Impacted wintering bald eagles (J. Carson, USFS, pers. commun.).

Also, the introduction of kokanee may not be a major benefit to wintering and migratory bald eagles. Bald eagles generally feed on kokanee durlng spawning when they are more vulnerable (Lint 1975). Kokanee at Anderson Ranch Reservoir spawn during October and sometimes in early November. Most bald eagles arrive In the area in late November and early December (J. Carson, pers. commun.). Kokanee are finished spawning when the majority of wintering eagles arrive. Therefore, kokanee provide fewer benefits to bald eagles than would occur if the eagles could capitalize on their increased vulnerability during spawnlng.

The osprey Is the one species that probably benefited from construction of the reservoir. They use the area during the breeding season when the fish supplies are accessible. VanDaele and VanDaele (1982) concluded that the establishment of Cascade Reservoir in west-central Idaho caused an increase in osprey numbers by producing increased fish availability. Schroeder (1975) also concluded that osprey populatlons In northern Idaho increased in response to increased abundance of spiny-ray fish and squawflsh following the construction of dams.

Most other raptors were adversely affected by the project. Inundation caused a loss of 1,221 acres of riparian habitats (forested and scrub-shrub wetlands) and 3,315 acres of upland habitat, decreasing the available prey supply. The loss of prey and nesting habitat adversely affected most raptor species.

SUMMARY

The Anderson Ranch Project covered 4,812 acres of wildlife habitat. The study area of concern included the reservoir, the dam site, the staging area by the dam, and the area within 100 meters of the reservoir shoreline. The study area totaled 6,516 acres.

Eight cover types were identified In the study area. All were reduced in the area after project construction except lacustrine open water. The project resulted in a loss of 18.3 miles of river and 6.7 miles of tributaries. Losses included 966 acres of deciduous forested wetlands, 256 acres of deciduous scrub-shrub wetlands, and 275 acres of free-flowing river. Upland areas reduced by the project included 2,200 acres of shrub-steppe, 280 acres of evergreen forest, 270 acres of deciduous shrubland, and 565 acres of agriculture/pasture.

The HEP was used to evaluate pre- and post-construction wildlife habitat conditions. Evaluation species were selected to represent important species groups. Impacts for evaluation species were measured in terms of the difference between pre- and post-construction Habitat Units (HU's), a measure of habitat quantity (habitat area) and quality (Habitat Suitability Index or HSI). For a given species, one HU is equivalent to one acre of prime habitat (HSI = 1.0).

The study area contained an estimated 5,676 acres of big game habitat prior to construction, while it presently contains 1,704 acres (Table 8). The project resulted in a loss of 2,689 HU's for mule deer. This loss is considered representative for Rocky Mountain elk in the study area. The black bear and the mountain lion were also affected by the project, but habitat losses were not quantified. Other project-related Impacts Include the annual winter loss of big game dying as a result of ice conditions on the reservoir. Annual Ice-related losses of mule deer are estlmated to range from one or two to over 30; the average annual loss is estlmated to be six deer.

The study area contained an estimated 2,382 acres of aquatlc furbearer habitat prior to construction, while the reservoir currently has 1,727 acres along its shoreline. Using the mink model, the pre-construction habitat quality along the river and its tributaries was high, while the reservoir currently provlides lower-quality habitat. A loss of 1,197 HU's was estimated for the mink. Due to an average annual drawdown of 62 feet and complete loss of 25 miles of river and tributary habitat, this loss is considered an underestimate for beaver, muskrat, and river otter.

Table 0. Summary of wildlife habitat impacts associated with construction and operation of the Anderson Ranch Project, South Fork of the Boise River, Idaho.

Group (evaluation species)	Pre-construction			Poet-constructlon			Impacts	
	Habitat acres	HSI	HU's	Habitat acres	HSI	HU's	Habitat acres	HU's
Big game								
Mule deer	5,676	0.60	3,016	1,704	0.72	1,227	-3,972	-2,689
Aquatic furbearers								
Mink	2,302	0.80	1,005	1,727	0.41	708	-655	-1,107
Waterfowl								
Mallard	2,263	0.48	1,006	56	0.85	46	-2,227	-1,046
Up land game								
Ruffed grouse	1,006	0.05	056	40	0.03	37	-966	-010
Blue grouse	4,412	0.72	3,177	1,662	0.72	1,107	-2,750	-1,980
Nongame species								
Black-capped chickadee	1,006	0.92	026	40	0.89	36	-066	-890
Yellow warbler	616	0.65	400	00	0.43	30	-526	-361

Prior to project construction, the study area had an estlmated 2,283 acres of waterfowl breedlng habitat along the river and Its tributaries, while the reservoir currently has an estlmated 56 acres suitable for nesting. Using a mallard model, the project resulted In an estimated loss of 1,048 HU's of waterfowl habitat.

The forested wetlands within the study area provided an estlmated 1,006 acres of ruffed grouse habitat, while the study area presently provides only 40 acres. Upland habitats provided an estimated 4,412 acres of blue grouse habitat, and presently provlde 1,662 acres. The project resulted in the loss of 919 HU's for game bird species associated with forested wetland habitats, and 1,980 HU's for game bird species associated with upland habitats

Although over 4,800 acres of nongame habitats were inundated by the project, impacts to nongame species were estimated only for wetland cover types and the upland deciduous shrubland cover type. The black-capped chickadee model was used to evaluate the quality of the overstory in forested wetlands, and the yellow warbler model was used to evaluate scrub-shrub wetlands and deciduous shrub I ands. The project resulted In estimated losses of 890 HU's for nongame species dependent on forested wetlands, and 361 HU's for nongame species dependent on scrub-shrub wetlands and deciduous shrublands.

The project adversely affected wintering bald eagles. The reservoir currently provides little open water habitat during most winters, while the river prior to the project remained open. Whitefish were also eliminated from the study area as a result of the project. Ospreys are the one raptor species that probably have benefited from the project.

HYDROELECTRIC PORTION OF PROJECT'S IMPACTS

We feel that all wildlife and wildlife habitat losses directly resulting from the project should be attributable to the hydroelectric project purpose. We support the postion forwarded from the Columbia Basin Fish and Wildlife Technical Committee to the Northwest Power Planning Council (letter of 12 December 1985):

> "In considering this issue, it is important to recognize that for power production a certain 'head' or water level is needed. Other uses remove or release water, but the water level needed for power production Is maintained and coordinated in the Columbia River system. Consequently, we view the prlmary loss of habltat and wildlife attributable to hydropower as belng that habitat eliminated by inundation and fluctuation of pool and operatlng levels needed for power production, and the wildlife dependent on that habitat.
>
> "This Is a somewhat simplistic approach and it does not consider secondary Impacts. We believe, however, that It Is a reasonable and realistic approach. This should be the basis for proposing mitigation Thls will not provide 100% mitigation and asks only that ratepayers fund those direct impacts of hydropower development and operation."

CURRENT CONCERNS

Rlparian plant communities (forested, scrub-shrub, and emergent wetlands) constitute less than 1% of the land surface of Idaho. Acre for acre, they are the most valuable fish and wildlife habitat. There are concerns for the quality and quantity of these habitats that are crltical for waterfowl and aquatic furbearers and very important for bald eagles, mule deer, and many other species of game and nongame wildlife In the Anderson Ranch vicinity, there are concerns about livestock grazlng and all Impacts in the riparlan habitats remaining along the South Fork of the Boise River. There Is a concern that an active bald eagle nest may exist in the reservoir area. This year the USFWS and USBR are cooperating on a breeding bald eagle survey of Anderson Ranch Reservoir. If an active nest is found, then a nest site management plan will need to be developed.

There are also concerns for the quality and quantity of sagebrush-grassland habitats In the general vicinity. These habitats are very important for mule deer, elk, ferruginous hawks, blue grouse, and many other species of game and nongame wildl ife. For the upland habitats remaining in the Anderson Ranch vicinity. It appears a primary concern is for the deteriorating browse conditions on mule deer and elk winter ranges.

For many social and economic reasons, there are needs to increase populations of big game, waterfowl, furbearers, game birds, nongame, and threatened and endangered species within the Boise River Basin. In order to meet these needs, the prlmary concerns are that important iparian and upland habitats be protected and improved for wildlife.

BLACK CANYON

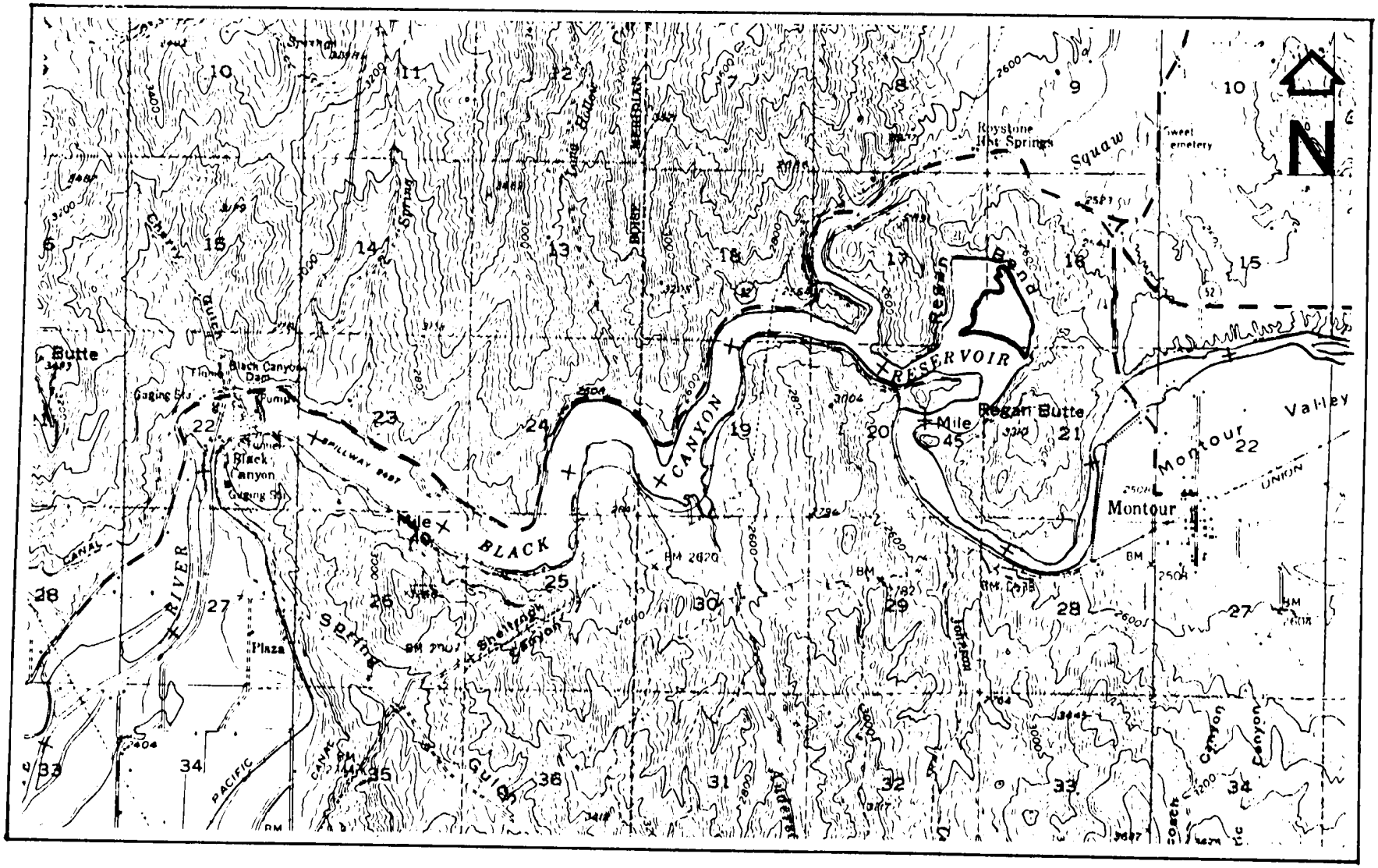
PROJECT DESCRI PT ION

The Black Canyon Dam is I ocated on the Payette River near Emmett, Idaho (Figure 3). The 183-foot-high structure is a concrete gravity type dam wlth an ogee overf low spil lway. Crest I ength is 1,039 feet. The facil ity has the capacity to divert water from the Payette River at a rate of 1,360 cfs. The dam contains two electrical generating units with a total installed capacity of 8,000 kilowatts..The reservoir, at f ul I pool, extends approxlmately ni ne miles upstream from the dam and covers about 1,100 acres (Chaney and Sather-Blalr 1985b). During the last three years, the reservoir drawdown has averaged 42 feet and ranged from 20 to 72 feet. There were no w il dl ife mitigation measures identified in the mitigation status report for this project (Chaney and Sather-Bl ai r 1985b).

Bl ack Canyon Reservoir initially had the capacity for about 44,000 acre feet of water. By the early 1970's, sedimentation, mainly at the upper end of the reservoir, had reduced the capacity by about one-third. Chronic deposition of sediments has conti nued to reduce the reservoi r' s capacity.

The Payette River provides nearly all the water that flows into Black Canyon Reservol r. Squaw Creek is the only other major reservoir tributary. Fl ows bel ow Bl ack Canyon are parti al ly control l ed by upstream reservoirs and diversions. Normal maximum di scharges of about 8,900 and 11,200 cf s occur durlng April and May, respectively. Minimum discharges of about 1,000 cfs occur in October and November. Cascade and Deadwood Reservoirs can regulate only 23% of the watershed. As a resul t, flows of 30,000 cfs have occurred (USFWS 1985). From October 15 to December 1, flows are tied to power demands. Fl ows general ly range from 1 ,200 cf s to 1,800 cf s. ne maintenance may require the drawdown of Black Canyon Reservoir nearly every year after October 15 (J. Hansen, USBR, pers. ccmmun.).

The Black Canyon project's authorized purposes are irrigation and power producti on. The project is part of the USBR's Boise Project author ized March 27, 1905. The dam was authorized June 26, 1922 by the Secretary of the I nteri or. Construction was canpleted In 1924 (Chaney and Sather-B lair 1985b). Deadwood Dam Is an integral part of the Black Canyon Project. Deadwood Dam was authorized in 1928 exclusively for the purpose of storing water for power generation at Black Canyon; the entire cost of the Deadwood facility was to be repaid from power revenues (USBR 1949:57-59). Constuction of Deadwood Dam was completed in 1931.


Butte
Black Canyon Dam
Gaging Sta.
Pump
Tunnel
Black Canyon Gaging Sta.
SPILLWAY BEST
BLACK
CANYON
RIVER
CANAL
Mile 40
Mile 45
Regan Butte
RESERVOIR
Regan Bend
Squaw
Rhyolite Hot Springs
Sweet Cemetery
Montour
Montour Valley
UNION
Plaza
Spring Gulch
Shellrock Canyon
PACIFIC
CANAL
BOISE
MERIDIAN
Jackson Canyon
Canyon
Johnson
BM 2620
BM 2504
BM 2600
BM 2600
BM 2504
BM 2600
BM 2600
BM 2600

Deadwood Reservoir is located on the Deadwood River, a tributary of the South Fork of the Payette River (Figure 4). The dam is a concrete-arch type structure, with a structural height of 165 feet and a hydraulic height of 137 feet. The base width is 62 feet and the crest width is 9 feet. The crest is 749 feet long at elevation 5,340 feet. The spillway is an ungated overflow section in the middle of the dam, with a capacity of 11,500 cfs. The outlet works consist of two 66-inch diameter conduits through the lower part of the dam, with a capacity of 2,050 cfs (Chaney and Sather-Blair 1985b). At full pool, the reservoir is about 4 miles long, 2 miles wide, and covers 3,092 acres. During the last 10 years, the reservoir drawdown has averaged 44 feet and ranged from 34 to 60 feet.

The lower reach of the Deadwood River extends 24 miles from the dam to the mouth at the South Fork of the Payette River. The flows in this reach are regulated by Deadwood Dam and supplemented by tributary flows. Flows released from the dam are generally either 2 cfs or greater than 300 cfs. Flows between 2 cfs and 300 cfs usually do not occur because the existing valves cannot be used for releases less than 300 cfs without extreme wear. Also, the water storage facilities cannot store enough water to maintain winter flows of 300 cfs and still have enough stored water. Releases are usually shut off completely from early October through late April or early May. Flows directly below the dam during this time are generally 2 cfs as the result of leakage. In the spring, flow releases are made according to the criteria in the Deadwood Dam operating procedures. Flows are not changed at a rate greater than 250 cfs per 24 hours (J. Hansen, USBR, pers. commun.). Release rates normally peak in August at about 800 cfs, and then decrease from about 600 cfs to almost zero in October or November.

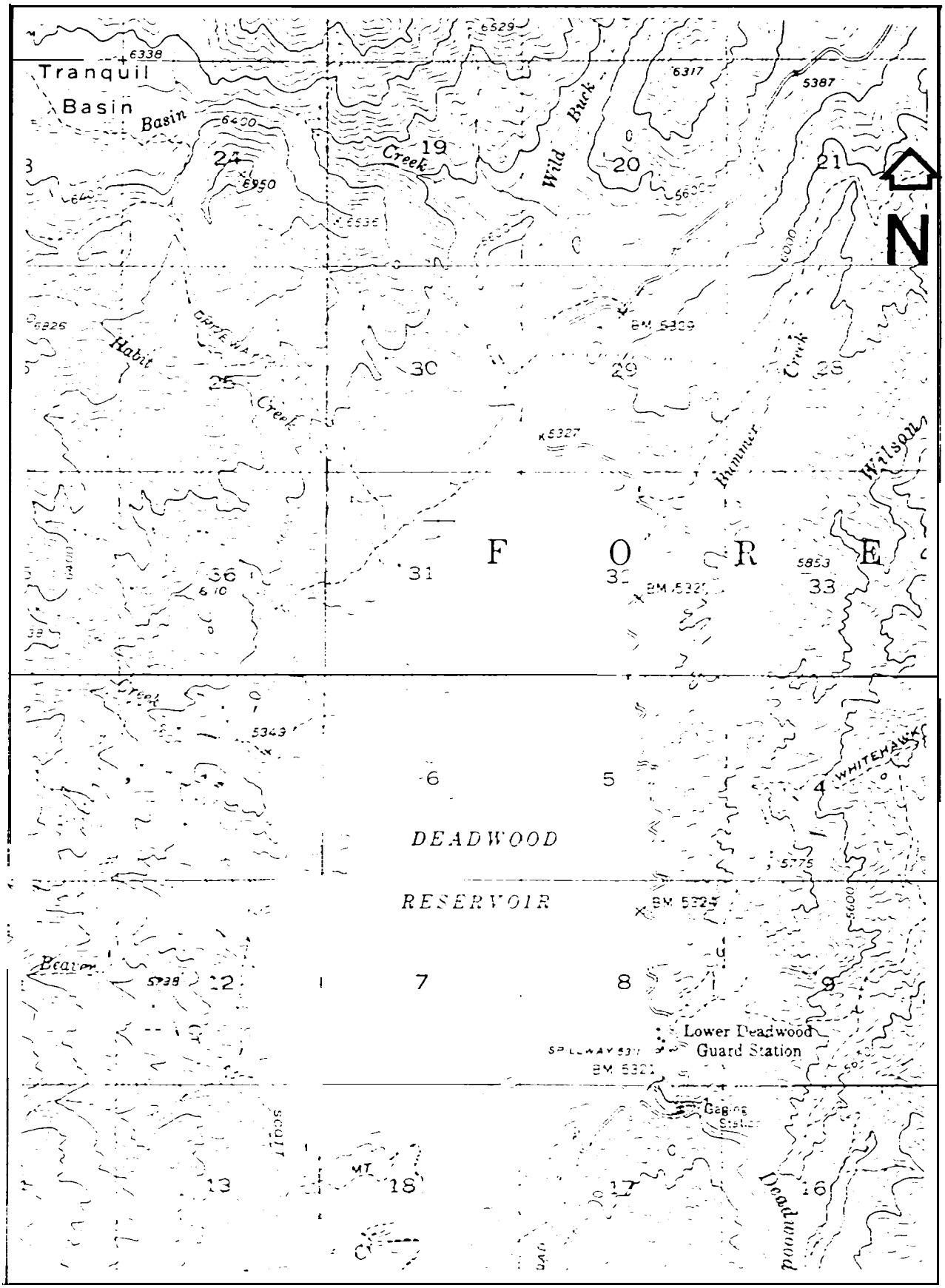


Figure 4. Post-construction nap of Deadwood Reservoir and general vicinity.

STUDY AREA

The Black Canyon and Deadwood study areas are in the Payette River Basin In southwestern Idaho (Figure 5). Main features of the basin include Black Canyon, Deadwood, and Cascade Reservoirs. Cascade Reservolr, about 70 miles north of Boise, and Deadwood Reservolr provide water storage for the lower Payette River Basin. The total drainage of the Payette River, upstream from Black Canyon Reservoir, totals about 1,830,400 acres. Yearly run-off for each reservoir Is listed in Table 9.

Table 9. Annual run-off information for the Payette River Basin.

Area	Average yearly run-off (acre-feet)
Payette River Basin	2,288,OOO
Black Canyon Reservoir	2,213,OOO
Cascade Reservoir	716,400
Near Deadwood Reservoir	117,700

The climate of the study area varies according to elevation. The Black Canyon area has a relatively mild climate characterized by long, hot summers and mild winters. An average high temperature of 92°F occurs In July, and the average low temperature in January is 20°F. Average precipitation is about 20 inches per year. Over 75% of the total precipitation occurs between October and May (USBR 1984).

Short, warm summers and long, cold wlnters characterize the higher areas such as Deadwood Reservolr. Average annual low temperatures are about -24°F, while average annual highs are 96°F. Annual precipitation is about 40 inches, most of which occurs in winter as snow. Average annual highest snow depth from 1949 to 1985 was 52 inches. The range of highest annual snow depths was 13 to 76 inches.

For the purpose of this impact assessment, the study area included the Black Canyon and Deadwood dams and reservoirs and the Black Canyon power plant stag i ng areas, and extended 100 meters from the boundaries of the reservolrs. The 100 meters adjacent to the reservoirs were included in the evaluation to credit the post-construction area with beneficial effects resulting from the project. Waterfowl and aquatlc furbearers require terrestrial habitats adjacent to water. An evaluation of post-construction habitat values for these species necessarily must include an area of land adjacent to the reservoirs. Literature supports the assumption that most of the habitat needs of breeding mallards (Bellrose 1976) and aquatic furbearers (Burgess 1978, Melqulst et al. 1981), are met within 100 meters of open water. The 100-meter area also includes the area where habitat may have changed as a result of the project. When there are habitat changes, they tend to be from upland communities to wetland communities. For land-related evaluation species (big game, upland birds, nongame), the Habitat Units

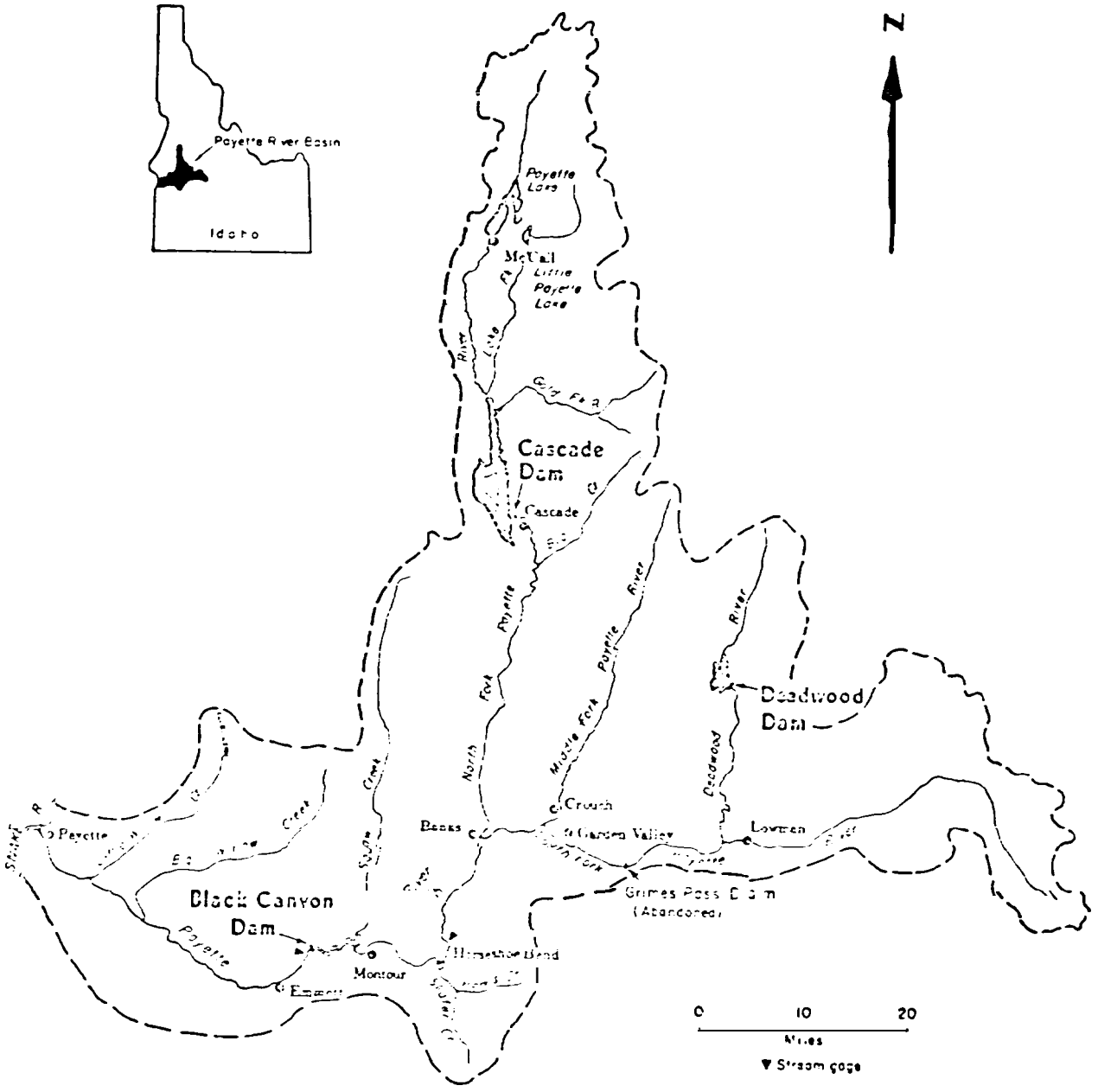


Figure 5. Payette River Basin

(HU's) provided by the 100-meter area in the post-construction evaluation cancel the HU's provided by the 100-meter area in the pre-construction evaluation, except when habitat changes have occurred as a result of the project. When wetland vegetation becomes established in place of pre-construction upland vegetation, the 100-meter area tends to provide more HU's, and the net losses of the project are reduced. For water-related evaluation species (waterfowl, aquatic furbearers) the 100-meter area is not evaluated under pre-construction conditions except, rarely, when it occurs within 100 meters of a pre-construction river. Again, when portions of the 100-meter area are evaluated under both pre- and post-construction conditions, the HU's cancel if the habitat suitability is unchanged. Usually, the 100-meter area surrounding the reservoirs Is evaluated for waterfowl and aquatic furbearers only under post-construction conditions. Therefore, extending the study area 100 meters beyond the reservoirs' boundaries reduces the net losses of the project.

The effects of flow releases are discussed; however, the river corridors downstream from the dams were not included in the study area. The transmission corridor, while part of the hydroelectric facility, was not included because BPA will be negotiating an agreement with the state ". ..regarding transmission lines and their effects on wildlife and its habitat" (Northwest Power Planning Council 1984). The impacts of recreation facilities and increased human uses that have occurred as a result of the project's reservoirs were not quantified or considered in habitat evaluations because they are not considered direct impacts to be assessed under the Columbia River Basin Fish and Wildlife Program.

METHODS AND MATERIALS

The Habitat Evaluation Procedure (HEP) developed by the USFWS (198Oc) was used to evaluate the quality of wildlife habitats in the project area for pre- and post-construction conditions. An interagency team of biologists selected ten target species and, for all but the Rocky Mountain elk, evaluated habitat quality based on selected species models. Each of these target species was chosen because it either is of high priority according to state or federal programs, or because it is an indicator species used to describe habitat conditions for other species with similar habitat needs.

Through correspondence and discussion with agencies and the Shoshone-Bannock Tribes, the following target species list was agreed upon:

Species	Reason for selection
Mule deer	indicator big game species.
Rocky Mountain el k	Important big game species in Deadwood area.
Mal lard	Indicator waterfowl species.
Canada goose (Branta canadensis)	Important waterfowl spec ies in Black Canyon area.
Spruce grouse (Dendraqapus canadensis)	important game bird spec ies in Deadwood area.
Ring-necked pheasant (Phasianus colchicus)	important game bird species in Black Canyon area.
Mink	indicator aquatic furbearer species.
Black-capped chickadee	indicator species for wildlife associated with forested wetlands.
Yel low warbler	indicator species for wildlife associated with scrub-shrub wetlands.
Yellow-rumped warbler (Dendroica coronata auduboni)	Indicator species for wildllfe associated wlth evergreen forests.

At Bl ack Canyon, the HEP was used to evaluate pre- and post-construction habitat conditions for the mule deer, mallard, Canada goose, mink, ring-necked pheasant, black-capped chickadee, and yellow warbler. At Deadwood, the mule deer, mink, spruce grouse, yellow warbler, and yellow-rumped warbler habitats were evaluated.

The USBR, IDFG, and USFWS have no documentation of pre-project conditions for wiidiife (Chaney and Sather-Blair 1985b). During preparation of the wildlife mitigation status report, inquiries requesting pre-project perspective were directed to Emmett Public Library, Idaho Historical Society, U.S. Geological Survey, Idaho Department of Water Resources, and USBLM (CHaney and Sather-Blair 1985b). The USBR provided some useful material from its archives. Pre-construction species lists and wildlife information were obtained from interviews with Montour area residents conducted by M. Buckendorf of the Idaho State Historical Society (ISHS) for the USBR. Additional information was obtained from old newspaper articles from the Idaho Historical Library.

Post-construction species lists and wildlife information were obtained from published documents describing the Black Canyon Reservoir and surrounding area (USFWS 1980b, 1985; USBR 1984). Additional information was obtained from interviews with wildlife professionals, USFS recreation and range management personnel, and local residents.

Vegetation mapping of the post-construction period was done using 1981 black-and-white aerial photography (scale 1:24,000) of the Black Canyon area, and 1980 black-and-white aerial photography (scale 1:9,000) of the Deadwood area. The National Wetland Classification System (Cowardin et al. 1979) was used to map the wetland plant communities. Upland communities were mapped using the classification system of the USFWS (1981).

Pre-construction aerial photographs do not exist for either the Black Canyon or Deadwood areas. Acreages of cover types affected by the project were estimated by using several clues. Pre-construction oblique photographs of portions of both areas were evaluated. For the Black Canyon area, long-time residents were interviewed concerning the existence of islands, riparlan hab itats, and agr icu l ture. The forested wetlands in the six miles above Black Canyon reservoir were mapped and measured in terms of forested wetland acres per mile of river. Also, 1960's aerial photography was used to assess the effects post-construction sedimentation has had on present habitat and island conditions in upper Black Canyon Reservoir. In addition to pre-construction oblique photographs of the Deadwood area, there Is a 1929 timber sale map which shows the Deadwood River and tributaries within the impoundment area. Widths of scrub-shrub wetlands associated with the Deadwood River and tributaries were estimated using a combination of post-construction aerial photography and field observations by the interagency team of biologists.

in order to assess losses and/or gains in wildlife habitats as a result of the project, vegetation communities and land uses were assessed for the study areas and vicinities. Vegetation cover type mapping was necessarily general due to the lack of resolution on the black-and-white aerial photographs. Ten cover types (i.e., plant communities or land use features) were identified:

> Deciduous forested wetland.-- This wetland type occurs in river bottoms and along tributaries. Woody vegetation is $\geq$ 20 feet in height. in the pre-construction study area, these forested wetlands occurred along the river bottom in the Black Canyon area. Presently, they occur along portions of the shoreline at the upper end of the reservoir where

sediments have filled in above the normal pool elevation. Black cottonwood and wiiiows dominate, with white aider (Alnus rhombifolia), green ash (Fraxinus pennsyivanica) and boxelder (Acer negundo) also present in the overstory. Understory shrubs include rose, hackberry (Celtis reticulata), red-osier dogwood, currants, and false indigo (Amorpha fruticosa). Many species of grasses and forbs exist, with reed canarygrass, sedges, horsetail (Equisetum spp.), rushes, nightshade (Solanum spp. , and goldenrod (Soldago spp.) being the most common.

Deciduous scrub-shrub wetland.-- in this cover type, dominant woody vegetation is < 20 feet in height. in the pre-construction study area, these wetlands appear to have occurred in the Black Canyon and Deadwood areas. At Bl ack Canyon, it was estimated that 10% of the deciduous wetland acreage (forested and scrub-shrub wetlands) was comprised of the scrub-shrub type. At Deadwood, it was estimated this type occurred in a 200-meter-wide band along the inundated portion of the Deadwood River, and occurred in a 15-meter-wide band along tributaries. Present l y, scrub-shrub wetlands occur in portions of the upper part of the Black Canyon area where sediments have filled in above the normal pool elevation. This type also occurs in the Black Canyon and Deadwood areas along tributaries above the reservoirs' high water lines. At Black Canyon and the river bottom of the Deadwood River above the reservoir, willows dominate an understory of reed canarygrass, sedges, forbs, and cattai l. In the tributary portions of the Deadwood area, shrubs include wil lows wh ite a l der, rose, serv iceberry, and vacc in l urn. Reed canarygrass is the common ground cover. Along the smaller Deadwood tributaries, there is a relatively open overstory of Engeimann spruce (Picea engelmannii), lodgepole pine (Pinus contorta), subalpine fir (Abies lasiocarpa), and a few quaking aspen.

Evergreen forested wetland.- This type presently occurs in portions of the Deadwood River bottom above the reservoir. It was estimated to comprise 10% of the acreage within the ZOO-meter-wide band along the inundated portion of the Deadwood River. In the river bottom above Deadwood Reservoir, this type occurs as a "spruce bog" with Engelmann spruce, lodgepole pine, and subalpine fir in the overstory; willows, alder, birch, and serviceberry in the shrub layer; and reed canarygrass and forbs in the understory.

Emergent wetland.- The species that comprise this type occur in most wetlands. They tend to be the dominant species when standing water inhibits establishment of woody species. Presently, it occurs at the upper end of the Black Canyon Reservoir near Montour, Idaho. Catta i l and reed canarygrass are the dominant species.

Evergreen forest.-- This type was extensive in the Deadwood Reservoir area. Presently, lodgepole pine dominates the overstory, with Engelmann spruce, subalpine fir, and Douglas-fir also present. Thin-leaved vaccinium (vaccinium membranaceum) and globe vaccinlum (Vaccinium globulare) are the most abundant shrubs. Other shrubs include serviceberry, Oregon grape, currants, spirea, and buffalo-berry (Shepherdia spp.). The understory includes elk sedge (Carex geyeri), pine grass (Calamagrostis spp.), lupines (Lupinus spp.), and other

grasses and forbs. Also scattered throughout the Deadwood area are seeps, draws, and north-facing aspects that support patches of predominantly Engelmann spruce that dominate an understory that includes WI I lows, serviceberry, spirea, reed canarygrass, and a diversity of forbs.

Shrub-steppe.- This type occurred in the Black Canyon area on hillsides above the river bottom. Presently, the domlnant shrub is big sagebrush, wlth relatively sparse antelope bitterbrush The dominant grasses are medusahead rye (Elymus caput-medusae) and cheat grass (Bromus techtorum), with bluebunch wheatgrass and squirrel-tail (Sitanion spp.) also present. There is a diversity of forbs including knotweed (Polygonurn spp.), western yarrow (Achilea millefolium arrowleaf balsamroot (Balsamorhiza sagittata), common salsify (Traqopoqon dubius), and moth muliein (Verbascum blattaria).

Aqriculture/pasture.- Pastureland or crops occurred in the Black Canyon area in relative flat areas above the river bottom wetlands.

Riverine rock bottom.-- This cover type describes the river channels prior to inundation.

Lacustr i ne open water. -- This type describes the reservoir pools.

Othe.-- This includes both dams and the Black Canyon reclamation areas. Roads were not included here because similar mileages of roadways appear to have been present in the study areas before construction as are present now. Post-construction increases in road acreages do not appear to be a direct result of the hydroelectric projects. Therefore, road acreages were included in the cover types in which they were located.

Habitat Evaluation Procedure

The black-capped chickadee, yellow warbler, and mink models are publ ished and available from the USFWS (Schroeder 1982, Schroeder 1983, Allen 1984). The mule deer, mallard, Canada goose, ring-necked pheasant, spruce grouse, and yellow-rumped warbler models are developed but unpublished (Appendix AI. The Rocky Mountain elk was not evaluated with HEP due to the lack of developed models pertinent to the Deadwood area.

With the HEP, each species model uses a number of measurable variables that are combined Into an equation which results In a sample site Habitat Suitability Index (HSI). The average HSI from all sample sites is used as the HSI value for a given evaluatlon species in a study area. This overall HSI is a number between 0 and 1.0. It is a quality index, or a measure of the capacity of a study area to meet the life requisites of the evaluation species.

To evaluate changes in wildlife hab itat quality associated wlth this project using the HEP, two scenarios had to be considered: baseline or pre-construction conditions and future-wlth-the-project or post-constructlon conditions. During informal meetings and the field work sessions, the Interagency team of biologists discussed samplng procedures to determine the HSI's for the evaluation species for both conditions. After a review of

available photographs and information, one important assumption was accepted : the habitat qualities of vegetation communities in or near the study area are representative of corresponding vegetation communities inundated by the project.

A number of variables had to be measured for the selected evaluation species models. Distance and interspersion variables were determined using post-construction aerial photography. Habitat varlabies such as tree and shrub heights, tree, shrub, and herbaceous canopy cover, and number of snags were measured in the field. At Deadwood, the interagency team of biologists spent one day in the area looking at cover types and selecting sampling locations, then split into two teams for one day to take field measurements. At Black Canyon, the interagency team of biologists spent one day looking at cover types and selecting sampling locations, then spent two days taklng field measurements. General sampling areas were selected based on their similarity to areas that were inundated by the reservolrs, or because they were considered representative of vegetation currently in the areas. Three line transects of 100 feet each were randomly selected within each sampling area. Vegetatlon measurements were taken along these transects.

For each evaluation species, the overall HSI was multiplied by the number of acres of habitat for those cover types needed by each species. This yielded the number of Habitat Units (HU's), a measure of quality and quantity of habitat available to the species. For a given evaluation species, one HU is equivalent to one acre of prime habitat. The difference in HU's for each evaluatlon species between pre- and post-construction periods represents the losses and/or gains of habitat, In terms of quality and quantity, that have resulted from development and operation of the Black Canyon Project.

The sampling design for determining HSI's and HU's varied for each evaluation species:

Mule deer.-- All cover types in both study areas were evaluated as mule deer habitat except riverine, l acustr ine, agr icu i ture/pasture, and "other". Field measurements were taken and HSI's calculated for a total of 12 locations representing 3 cover types at Black Canyon, and 14 locations representing 4 cover types at Deadwood. The evaluation of winter habitat suitability at Black Canyon assumed that winter thermal cover was adequately provided by sagebrush, forested and scrub-shrub wet l ands and topographic features. This was assumed because average snow depths are near zero, and because mule deer successfully winter in this area, which is many miles from evergreen forests. The evaluation for mule deer at Deadwood assumed the habitat was available only for summer range due to snow depths exceeding four feet. It was assumed that summer thermal requirements were met by the evergreen forest and deciduous wetlands. Therefore, mule deer habitat at Black Canyon was evaluated for winter HU's and habitat at Deadwood was evaluated for summer HU's.

Mallard.- Waterfowl habitat was evaluated only at Black Canyon. The evaluation team agreed that 100 meters on either side of main water channels should be evaluated as mallard habitat for the pre-construction per iod. For this analysis, 8.9 miles of river and the 1.4 miles of Squaw Creek were evaluated. Habitat variables were estimated from a

combination of post-construction aerial photography, field measurements, and field observations. The post-construction evaluation assumed that only the upper half of Squaw Creek and the portion of the reservoir upstream from the west end of Regan Bend provided mallard habitat suitable for evaluation with the mallard model. Similar to the pre-construction analysis, the 100 meters adjacent to the reservoir in these areas were evaluated as mallard habitat.

Canada goose.-- The evaluation procedure was essentially the same as for the mallard. The island conditions within the pre-project study area were inferred from the conditions in the six miles upstream from Black Canyon Reservoir.

Ring-necked pheasant.- Only the Black Canyon area was evaluated. The model was used to estimate the overall habitat suitability of the study area.

Spruce grouse.- The Deadwood area was evaluated by using the model to estimate the habitat suitability for all cover types except the scrub-shrub wetland along the Deadwood River.

Mink.- The area within 100 meters of waterways was evaluated as mink habitat for the Black Canyon and Deadwood study areas. The pre-construction evaluations used a combination of post-construction aerial photography and field measurements. At Black Canyon, 8.9 miles of river and the 1.4 miles of Squaw Creek were evaluated for pre-construction habitat value. At Deadwood, 4.8 miles of river and 11.1 miles of tributaries were evaluated for pre-construction habitat value. The post-construction evaluations used field data, aerial photography, and reservoir operations information. About 24 miles of shoreline were evaluated for Black Canyon, and 20.5 miles of reservoir shoreline were evaluated for Deadwood.

Black-capped chickadee.- This species was evaluated at Black Canyon only. The evaluation used field data from a total of six locations to assess the quality of overstory habitat in the forested wetlands.

Yellow warbler.- This species was evaluated at Black Canyon and Deadwood. For Black Canyon, the evaluation used field data from a total of seven locations to assess the quality of shrub habitat in the scrub-shrub wetlands. For Deadwood, the evaluation used field data from eight locations to assess shrub habitat quality in the scrub-shrub wetlands.

Yellow-rumped warbler.-- This species was evaluated at Deadwood only. The evaluation used field data from nine locations to assess the quality of overstory habitat in the evergreen forest and evergreen forested wetland.

RESULTS

HABITAT AND LAND USES

Pre-construction Conditions

Black Canyon.--The Black Canyon Reservoir inundated at least 1,057 acres, and the dam and reclamation areas covered 58 acres (Table 10). Within the area impacted (map located in Appendix B), the Payette River ran through a relatively narrow, steep-sided canyon. The dam inundated 8.9 miles of river and 1.4 miles of a large tributary. The riverine environment was most likely dominated by a cottonwood-willow complex with an understory of various shrubs and grasses. A photograph of the Black Canyon dam site, prior to dam construction, shows large rock outcroppings and shrub-like vegetation along the river edge (Emmett Index 1924). At least one island was present near Montour. A. York, a local resident, recalled picnicking on an island in the river (interview by M. Buckendorf, unpubl. rep., ISHS and USBR). Evaluation of 6 miles of river habitat upstream from the reservoir indicated there was an average of 18.6 acres of forested wetland and 1.3 islands per mile of river.

There were several farms along the river prior to dam construction. These were located primarily at Regan's Bend and areas west of Regan's Butte, on the south side of the river. Livestock grazing occurred on most farms and adjacent lands.

Deadwood area.--Deadwood Reservoir inundated at least 3,094 acres (Table 10). Within the area impacted, the Deadwood River flowed through a valley consisting of an extensive scrub-shrub meadow surrounded by evergreen forest. There were 4.8 miles of free-flowing river and 11.1 miles of tributaries within the impoundement area.

Land uses in the Deadwood area prior to inundation included mining and grazing. Several mines existed west of the river. Minerals removed were primarily lead, silver, and gold.

Historically, the Deadwood basin was grazed by both sheep and cattle. Livestock used the area when passing through from Garden Valley to Bear Valley.

Post-construction Conditions

Black Canyon.--Presently, riparian as well as shrub-steppe cover types exist in areas adjacent to the reservoir (Table 10). Forested wetlands exist near the upper end of the reservoir, generally in areas where sediment deposition has occurred since the dam was built The shrub-steppe cover type occurs on the hillsides above the reservoir.

Sediments have filled about one-third of the Black Canyon Reservoir's capacity (Chaney and Sather-Blair 1985b). Most of the sedimentation has occurred from the confluence of the river and the reservoir downstream to Regan's Bend. Studies conducted by the Soil Conservation Service and the USBR reported a total of 15,427 acre-feet of sediment deposited between 1924 and 1971 (USBR 1984). The average annual rate of sedimentation was 325

Table 10. Cover type acreages n the ack Canyon Project area[1] for pre— and post—construct on condit ons.

	Deciduous forested wetland	Evergreen forested wetland	Deciduous scrub-shrub wetland	Emergent wetland	Evergreen forest	Shrub-steppe	Agric./ pasture	River ne	Lacustr ne	Other[1]	Tota
Black Cany on											
Pre-construct on	196		24	0		1,158	406	246	0	0	2,030
Post-construct on	118		34	7		628	128	0	1.057	58	2,030
Net ga n or loss	-78		+10	+7		-530	-278	246	+1,057	+58	
Deadwood											
Pre-construction		36	390		3,321			29	0		3,776
Post-construction		0	4		678			0	3,094		3,776
Net gain or loss		-36	-386		-2,643			-29	+3,094		
Total											
Pre-construction	196	36	414	0	3,321	1,158	406	275	0	0	5 806
Post-construct on	118	0	38	7	678	628	128	0	4,151	58	5,806
Net ga n or loss	-78	-36	-376	+7	-2,643	-530	-278	-275	+4,151	+58	

[1]Includes dam and p ant stag ng areas

acre-feet during that period (SCS and USBR 1973). This build-up of sediments has filled the original stream bed in the area, impeding normal flow of water into the reservoir.

As a result of the construction of Black Canyon Dam, some wetlands have formed within the study area boundary. Sedimentation has resulted in the creation of about eight islands and a large forested and scrub-shrub wetland. The islands are in the upper part of the reservoir and support primarily scrub-shrub vegetation. The forested and scrub-shrub wetland located inside Regan's Bend was entirely water from the time of project construction until the mid-1960's when vegetation first became established on the building sediments. This wetland is presently 61 acres in size, and is dominated primarily by an even-aged stand of black cottonwoods with an understory of willows, reed canarygrass, and cattails.

Recreational use at Black Canyon Reservolr includes water skiing, motor boating, swimming picnicking, fishing, and hunting. The primary recreational use is water skiing. During 1984, there were 90,000 recreation use visits to the reservoir and 360,000 recreation use visitor hours. Recreational facilities include four picnic areas, four launch ramps, and a swimming beach (USBR, unpubl. data).

Waterfowl huntlng is very popular on the Payette River, especially from Horseshoe Bend to the mouth. The IDFG estimates that about 200 ducks and 50 geese were harvested at Black Canyon Reservoir in 1978. Presently, the reservoir is closed to waterfowl hunting. Harvest estimates are not available for ducks and geese downstream from Black Canyon Dam. However, hunter use is considerable in that area (USFWS 1985).

Grazing and farming also occur near Black Canyon. About 56% percent of the lands adjacent to the reservoir are privately owned and 44% percent are public lands managed by the USBR. The USBLM manages extensive tracts north of the study area. Currently, grazing occurs on both private and public lands. About 10% of the lands adjacent to the reservoir are cultivated.

Deadwood.--Currently the Deadwood Reservoir is surrounded by evergreen forest dominated by lodgepole pine (Table 12). Other tree species present include Engelmann spruce, subalpine fir, and Douglas-fir. Wetland habitats also occur adjacent to the tributaries and Deadwood River above the reservoir.

Flows on the Deadwood River below the dam have been altered as a result of the project. The highest monthly maximums are not significantly ($P>.05$) different between pre- and post-construction. However, timing of annual highest flows has been changed (Figure 6). Prior to the project highest average maximum flows generally occurred in May. Since the project, highest average maximum flows generally occur In August.

Pre- and post-constructlon average monthly minimum flows are significantly different ($P<.05$) for the months of October through May (Figure 7). This difference occurs primarily because the valves releasing the water from the dam are usually completely closed from October to April.

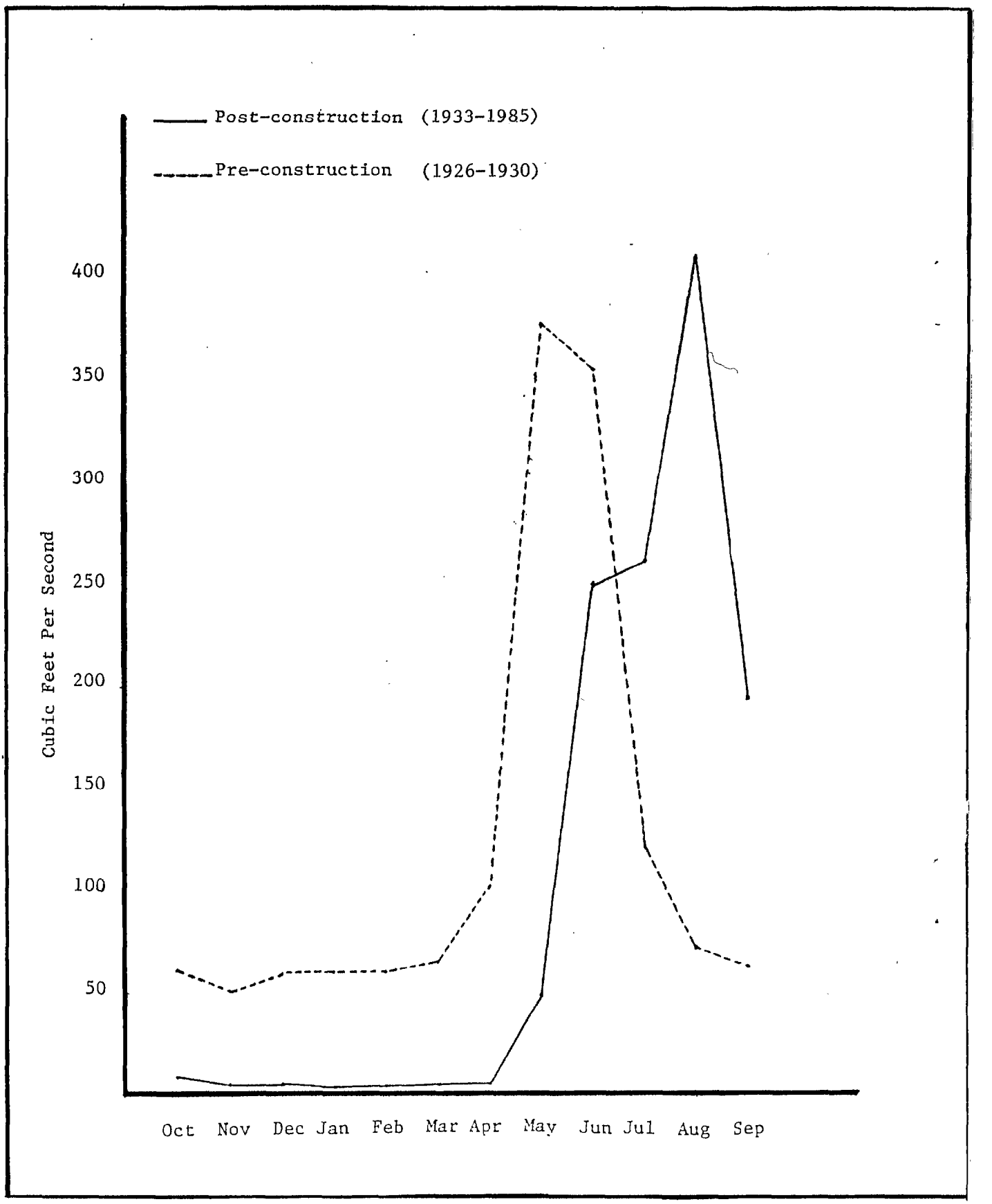
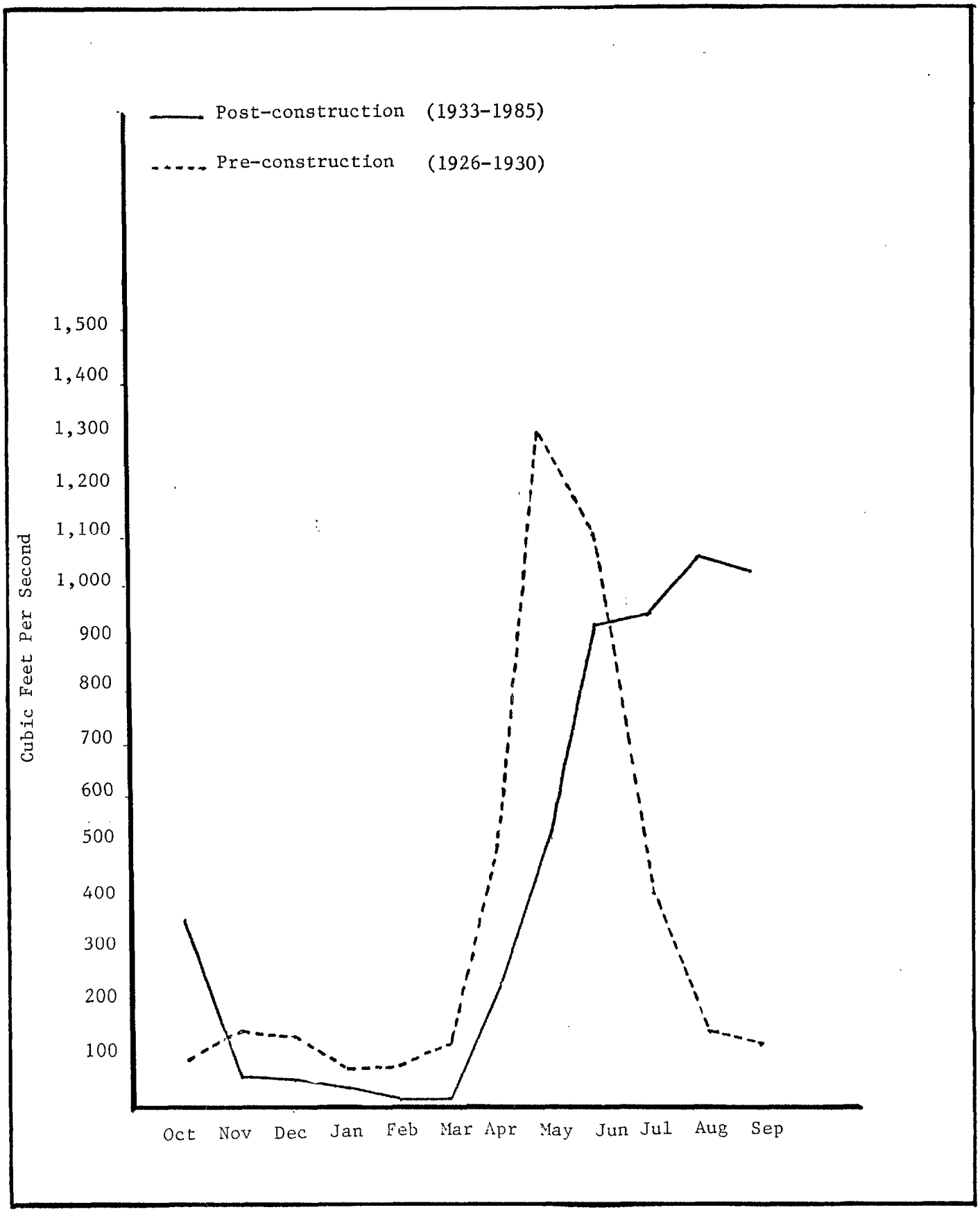


Figure 6. Pre- and post-construction average monthly maximum flows on the Deadwood River downstream from Deadwood Reservoir.



Fiqure 7. Pre- and post-construction average monthly minimum flows on the Deadwood River downstream from Deadwood Reservoir.

The present stream flows In the Deadwood River below the dam may be adverse to the development of an extensive riparian zone. Flows range from very high in the summer to almost no flow in the winters. Flow changes occur rapidly, and such fluctuations generally affect vegetation adjacent to the river. Vegetation most likely affected by unstable water flows are willows and cottonwoods. Usually, areas with more stable water levels have more extensive and dense development of riparian vegetation (Payne et al. 1975 in Asherln and Orme 1978). With the current information available, the Impacts of the project to downstream vegetation cannot be quantified. In order to determine what impacts have occurred and to what degree, specific studies designed to answer those questions would have to be implemented.

Recreational uses at Deadwood Reservoir include camping, fishing, hunting, and firewood collecting. The primary activity is fishing. During 1984, there were 10,000 recreation use visits to the reservoir and a total of 220,000 recreation visitor hours. Recreational facilities include four campgrounds with a total of 28 campsites (USBR, unpubl. data).

Timber harvesting also occurs on lands adjacent to Deadwood Reservoir. The first timber sale after inundation occurred in the 1950's. About 72 million board-feet have been cut since dam construction. Presently, five timber sales are planned in the next two to three years, involving about 33 million board-feet. Road construction has been associated with most past and proposed sales (D. Hail, USFS, pers. commun.).

Currently, the only grazing that occurs in the Deadwood area is in the Tranquil Basin northwest of the reservolr. The permit is a sheep allotment and, because of a decline in the demand for wool products, the permit has not been used for the last four years (M. Miller, USFS, pers. commun.).

THREATENED AND ENDANGERED WILDLIFE SPECIES

Endangered wlldlife species listed by the U.S. Department of Interior that occur in the project area include the bald eagle and gray wolf. Bald eagles have been sighted near Black Canyon Reservoir during the "mid-winter bald eag l e survey counts". Bald eagles have also been sighted at Deadwood Reservoir In the spring (Cadwallader, IDFG, pers. commun.) and in the fall (B. Martin, IDFG, pers. commun.).

The gray wolf is known to occur in the upper Deer Creek drainage northwest of Deadwood Reservolr. There have been 14 reliable wolf sightings near Deadwood over the past 15 years. Most of the sightings have occurred near Deer Creek Pass, while some of the sightings have been as close as one-half mile from the reservoir (INHP, unpubl. data).

The following species are listed as "Candidate species--category 2" under the Endangered Species Act and may be in the Black Canyon area: Swainson's hawk, ferruginous hawk, and long-billed curlew (Numenius americanus).

BIG GAME

Introduction

Four big game species are present in the project area. Black bears, elk, mule deer, and mountain lions occur in the Deadwood area. The Deadwood Basin provides summer range for both deer and elk. It also serves as a transition area between elk winter and summer ranges. Mule deer use the area during the summer months (D. Cadwallader, IDFG, pers. commun.). Mountain lions occur In areas where mule deer, their principal prey species, occur. The mule deer is the primary big game species present in the Black Canyon area. Pre- and post-construction mule deer population estimates are nonexistent for both Black Canyon and Deadwood Reservoirs.

A mule deer model was selected to quantify the effects of the project on big game habitats at both Deadwood and Black Canyon Reservoirs. The model was selected because of the mule deer's relative importance and abundance at both sites. The habitat components measured for the model are also important to elk and mountaln lion, as well as other sagebrush-associated species present at Bl ack Canyon.

Pre-construction Conditions

The mule deer was the major big game species present in the Black Canyon area prior to Inundation. Deer from the upper Squaw Creek drainage may have migrated down to Black Canyon, especial ly during severe winters. Mounta in lions may also have used the area during winters when deer were concentrated in the bottomlands.

Both elk and deer occurred in the Deadwood area prior to dam construction. Meadow areas along the river probably provided important elk calving grounds, and summer range for mule deer. Black bears and mountain lions were undoubtedly present prior to inundation.

For this habitat evaluation, it was assumed that all of the cover types except agriculture/pasture and riverine were used by mule deer during some portion of the year. This amounted to 1,378 acres of habitat in Black Canyon and 3,747 acres of habitat at Deadwood. A food suitabillty index of 0.45 was estimated for Black Canyon, and a food suitability index of 0.67 was estimated for Deadwood. Therefore, based on model calculations, the study area had an estlmated 620 HU's at Black Canyon and 2,510 HU's at Deadwood prior to construction of the dams.

Post-construction Conditions

Mule deer from the upper Squaw Creek drainage currently winter near Squaw Butte, directly north of Black Canyon Reservoir. Whether or not mule deer migrate down as far as the reservolr is generally a function of snow depth and winter severity. Increased numbers of road kills occur along Highway 52, on the north side of the reservoir, during severe winters (A. Ogden, IDFG, pets. commun.).

Currently, both deer and elk inhabit the Deadwood area. Numbers of elk are generally believed to have increased over the last 10 years. The increase Is due primarily to the change in the hunting season and regulations (A. Ogden, IDFG, pers. commun.).

The study area presently contains 787 acres of mule deer winter range at Black Canyon and 682 acres of summer range at Deadwood. Using the model, an HSI of 0.48 was calculated for Black Canyon, and an HSI of 0.63 was calculated for Deadwood. Therefore, the study area currently provlides an estimated 378 HUIs at Black Canyon and 430 HU's at Deadwood.

Impact Assessment

The project contained 5,125 acres of big game habitat prior to construction of the dams, while it presently contains 1,469 acres. The foi lowing mule deer habitat impacts were estimated:

Mule Deer HU's	
3,130	Pre-construction
808	Post-construction
-2,322	Change in mule deer HU's

FURBEARERS

Introduction

Several furbearer species occur in the project area. Furbearer species present at Black Canyon include mink, beaver, river otter, muskrat, raccoon, red fox (Vulpes vulpes) and bobcat (Appendix F) The same species are probably present at Deadwood wlth the exception of red fox (Appendix G). In addition, marten (Martes amerlcana) are also present at Deadwood. Pre- and post-construction population estimates for these species are not available for Black Canyon or Deadwood.

The mink model was selected to evaluate the effects of the project on aquatic furbearer habitats. The model was developed specifically for mink; however, habitat components measured for the model are also important to the other aquatic furbearers present.

Pre-construction Condltions

The principal furbearer species present at Black Canyon prior to construction included mink and beaver (interview with E. Pugh by M. Buckendorf, unpubl. rep., ISHS and USBR). Bobcats and muskrats were probably also present. Furbearer species present at Deadwood prior to inundation included marten, mink, beaver, and river otter (L. Cox, M. Koskella, and L. Hower, pers. commun.).

Prior to inundation, riparian and aquatic habitats along the Payette and Deadwood Rivers provided suitable aquatic furbearer habitat. Cottonwood and willow species were probably present, providing a food source for beavers. Some areas along the rivers probably provlded muskrats with preferred foods such as cattail, bulrush, arrowhead, and clover. Small mammals, reptiles, and amphibians associated with riparian habitats provided prey for mink, raccoons, and bobcats. The rlver provided native fish, a primary prey source for river otters, and a secondary food source for mink and raccoons.

The area in which mink were evaluated included 1,084 acres adjacent to 8.9 miles of river and 1.4 miles of tributary in the Black Canyon area, and 1,271 acres adjacent to 4.8 miles of rlver and 11.1 miles of tributaries in the Deadwood area. HSI's of 0.77 and 0.83 were estimated for Black Canyon and Deadwood, respectively. Therefore, the Black Canyon and Deadwood study areas were estlmated to have provided 835 HU's and 1,055 HU's, respectively, of mink habitat prior to construction of the dams.

Post-construction Conditions

Black Canyon Reservolr eliminated 10.4 miles of free-flowing water where several furbearer species resided. Now, beaver and muskrat activities are limited primarily to the rlver below the dam and the wetlands at the upper portion of the reservoir. Other furbearer species, such as raccoons, were similarly affected.

Currently, Black Canyon Reservoir provides about 24 miles of potential shoreline habitat for furbearers. The 42-foot average seasonal drawdown results in areas of reservoir bottom being exposed. As a result, the reservoir presently provides limited habitat for mink and other aquatic furbearers. Using the mink model for lacustrlne systems, an HSI value of 0.55 was calculated for 915 acres of potential habitat along the shoreline. Therefore, a total of 503 HU's of mink habitat are estimated to be currently available at Black Canyon Reservoir.

Deadwood Reservolr eliminated 15.9 miles of free-flowing water where several furbearer species occurred. Currently, beaver activity is restricted primarily to the river and reservoir tributaries. Other aquatic furbearer species such as mink and muskrat were simiiarly affected.

Currently, Deadwood provides 20.5 miles of potential shoreline habitat for furbearers. The 44-foot average annual drawdown results in large expanses of reservoir bottom being exposed. As a result, the reservoir provides limited habitat for mink and other aquatic furbearers. Using the mink model for lacustrlne systems, an HSI value of 0.10 was calculated for 682 acres of potential habitat along the shoreline. Therefore, a total of 68 HU's of mink habitat are estimated to be currently available at Deadwood Reservoir.

Inundation at Deadwood also eliminated 2,643 acres of evergreen forest inhabited by marten. The marten distribution is closely associated with evergreen or mixed forest stands (Strickland et al. 1982).

Impact Assessment

The project contained 2,355 acres of aquatic furbearer habitat along 26.3 miles of river and tributaries prior to construction of the dams, while the reservoirs currently have 1,597 acres of potential shoreline habitat..Using the mink model, quality of habitat along the rivers and tributaries was found to be high, while the reservoirs currently provide less suitable habitat. As a result, the following change in HU's was calculated:

Mink HU's	
1,890	Pre-construction
571	Post-construction
-1,319	Change In mink HU's

WATERFOWL

introduction

Several waterfowl species occur In the Black Canyon area (Appendix F). Species that commonly nest In this area include Canada goose, mallard, teal, gadwall, American wigeon and ruddy duck. The mallard and Canada goose are the most common and economically Important species present.

Several waterfowl species use Deadwood Reservoir for resting, primarily during the fall migration (Appendix G). Very few waterfowl nest on the reservoir. The reservolr is iced over during the winter preventing waterfowl winter use.

Canada goose and mallard models were selected to evaluate the effects of the project on waterfowl habitats at Black Canyon Reservolr. Habitat components measured for the models, especially the mallard model, are also Important for other waterfowl species. Pre- and post-construction population estimates for the two target species, specifically for the Black Canyon and Deadwood areas, are nonexistent.

Pre-construction Conditions

Local residents recall seeing ducks and geese near Black Canyon (interview wlth A. McConnel and J. Curtis by M. Buckendorf, unpubl. rep., ISHS and USBR). J. Curtis said, "The skies would be filled with ducks back then". Both men also commented that duck populations have drastically declined over the years, but goose numbers have Increased. The increase in goose numbers and decrease In duck numbers are the result of many factors affecting waterfowl populations other than the habitat losses and changes resulting from the construction of Black Canyon Reservolr. Most geese near or in the project area are residents. Goose populatlons have increased primarily as the result of more conservative hunting regulations and habitat enhancement such as the construction of nesting platforms (A. Ogden, IDFG, pers. commun.).

A 100-meter band along the shorelines of the river and Squaw Creek within Black Canyon Reservoir was evaluated as mallard and Canada goose habitat. This delineation assumed that most of the habitat needs for waterfowl occur close to water. The habitat that existed within the 100-meter band was estimated from a combination of post-construction aerial photographs, field observatlons on and above the reservoir, and interviews with long-time residents. Habitat variables were estimated from a combination of post-construction aerial photography, field measurements, and field observations. There were eight islands in six miles of river upstream from the reservolr; therefore, a minimum of one island per mile was assumed for the pre-construction Canada goose evaluation. Sample site HSI's were estimated at one-half mile intervals on a map on which the estimated pre-project habitat had been drawn.

The pre-construction Black Canyon study area had estimated HSI values of 0.55 for the mallard and 0.55 for the Canada goose for 1,084 acres of suitable habitat. Therefore, the area provided an estlmated 596 HU's for both the mallard and the Canada goose.

Post-construction Conditions

Waterfowl nestlng occurs along the Payette River near Black Canyon Reservolr. Islands below the reservolr provide safe nesting sites. The upper portion of the reservoir also provides safe nesting and feeding areas for waterfow I. The entire reservoir provides resting habitat.

The Payette River Is an important nesting and brood-rearlng area for Canada geese. The best nestlng along the main Payette River occurs between Gardena and Horseshoe Bend, in the Montour Valley, and below Black Canyon Reservoir (USFWS 1985). Most nesting occurs on natural islands and artificial platforms. Platforms have been constructed in the Montour area, as well as downstream from Black Canyon Dam. The pastureland at Montour also provides brood-rearlng areas for resident Canada geese.

Canada goose populatlons vary from year to year due to annual changes In production and mortality (including hunting). The IDFG conducts a trend count each spring to obtain estimates of breeding pairs on the Payette River (Figure 8) These aerial counts indicate general trends in breeding populations, not actual numbers (USFWS 1980b).
Canada goose distribution and production on the Payette River is influenced primarily by quantity and quality of nestlng habitat. The majorlty of geese using the Payette River below Emmett nest on islands, either on the ground or on woody debris. The average clutch size of successful nests during a 10-year period ranged from 5 to 5.5 eggs per nest (USFWS 1980b).

Goose productivity is also affected by water flows In the river during the average nesting and incubation period, February 15 to May 15. During low flows, land bridges form between islands and the mainland. Land br idges increase predator and human access to ground nests, generally resulting in a loss of production. Also, fewer pairs attempt to nest during low flows. High flows after nest establishment flood many nests when low profile islands or mainland areas become completely or partially covered with water (USFWS 1980b).

The IDFG has recommended water flows between 3,500 and 7,000 cfs from February 15 through May 15 for the Payette River downstream of Black Canyon. Improved nesting conditions and hatching success occur when flows are maintained within this range. At flows below 2,500 cfs, loss of island integrity becomes severe. At flows greater than 9,000 cfs, the amount of nesting habitat is severely reduced by flooding of low profile islands (USFWS 1980b).

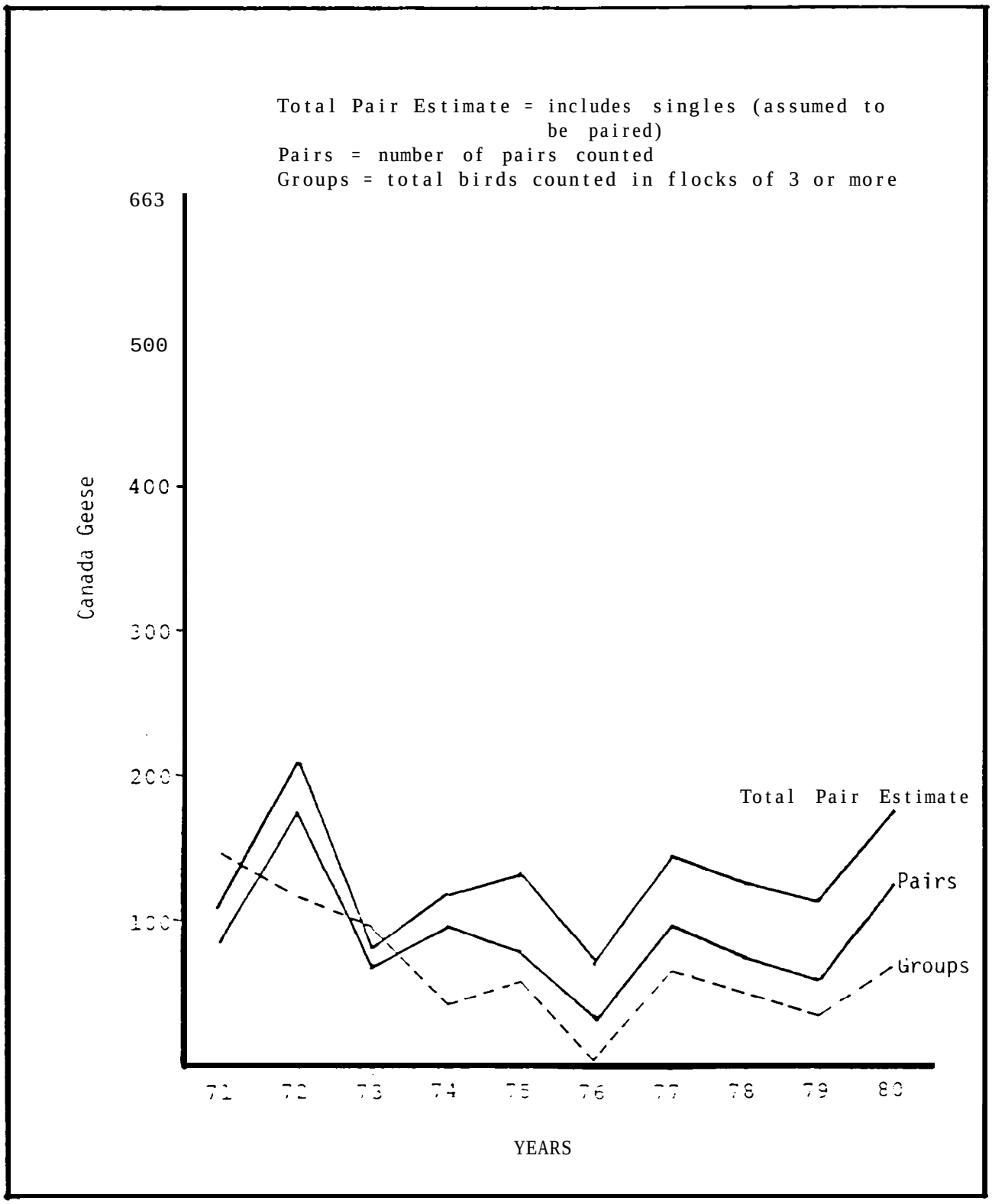


Figure 8. Late March Canada goose breeding population trend count (aerial) data for the Payette River from 1371 through 1980 (USFWS 1982).

Flows downstream generally exceed the recommended range (Table 11). On the average each year (1925-1985), 34 days had flows less than 2,500 cfs, and 10 days had flows in excess of 9,000 cfs, during the nesting and incubation period.

Table 11. Post-construction flows on the Payette River, downstream from Black Canyon Dam (1925-1985).

	February		March		April		May	
	cfs	std dev	cfs	std dev	cfs	std dev	cfs	std dev
Monthly mean	2016	(994)	2849	(1481)	5427	(2582)	7716	(3208)
Average monthly maximum	3559	(2220)	4936	(3064)	8905	(4354)	11216	(4473)
Average monthly minimum	1245	(727)	1594	(1037)	2833	(1648)	4798	(2458)

Black Canyon Reservoir does not have the potential to regulate spring flows within the recommended range. The reservoir provides little storage and has no significant control on flows downstream from the project. Prior to dam construction, flows upstream near Horseshoe Bend generally exceeded the recommended range (Table 12). On the average, 36 days had flows less than 2,500 cfs, and 13 days were in excess of 9,000 cfs, from February 15 to May 15. Even without the presence of Black Canyon Dam, flooding and low flows would occur downstream of the reservoir. However, flows might be better regulated by storage and release of water upstream at Cascade and Deadwood Reservoirs.

Table 12. Flows on the Payette River near Horseshoe Bend, upstream from Black Canyon Reservoir.

	February		March		April		May	
	cfs	std dev	cfs	std dev	cfs	std dev	cfs	std dev
Pre-construction (1907-1924)								
Monthly mean	1314	(410)	2487	(1707)	6347	(3370)	10110	(4129)
Average monthly maximum	1754	(851)	4955	(4297)	9385	(3672)	13817	(3518)
Average monthly minimum	1100	(261)	1317	(486)	3063	(1648)	6263	(2008)
Post-construction (1925-1985)								
Monthly mean	1628	(815)	2883	(1229)	5103	(2235)	8009	(2863)
Average monthly maximum	2533	(1650)	3800	(2315)	8221	(3804)	11390	(3962)
Average monthly minimum	1156	(506)	1503	(781)	2854	(147)	5225	(2095)

The selected models assume that mallards and Canada geese requires open water with proximate wetland vegetation for summer nesting and brood-rearing habitats. Therefore, only the upper half of Squaw Creek and the upper reservoir above the west end of Regan Bend were evaluated as post-construction waterfowl habitat. Islands were evaluated as well as the 100-meter band. The evaluation estimated that 466 acres of waterfowl habitat provide HSI's of 0.70 for the mallard and 0.82 for the Canada goose. As a result, Black Canyon provided an estimated 326 HU's for mallards and 382 HU's for Canada geese.

Impact Assessment

Black Canyon provided an estimated 1,084 acres of suitable waterfowl habitat along the river and Its tributaries while the reservoir currently provides an estlmated 466 acres of suitable habitat. As a result, the following impact was estlmated using the mallard model:

Mallard HU's

596	Pre-construction
326	Post-construction
-270	Change In mallard HU's

The project resulted In an estimated loss of 270 HU's for mallards. This is considered representative for other resident waterfowl in the study area.

Black Canyon also contained an estlmated 1,084 acres of suitable Canada goose habitat while the reservoir currently has 466 acres. The study area provided more habitat acres prior to the project, but currently provides higher habitat suitability for Canada geese. As a result, the following impacts were estimated:

Canada goose HU's

596	Pre-construction
382	Post-construction
-214	Change In Canada goose HU's

UPLAND GAME BIRDS

I ntroduct ion

Upland game birds present at Black Canyon Include the ring-necked pheasant, Chukar, gray partridge, California quail, and mourning dove (Zenalda macroura). At one time, mountaln quail were also present near Black Canyon Reservo i r . All the upland game species present at Black Canyon are Introduced species except the mourning dove. The mountain quail may or may not be native to western Idaho (Ormiston 1966, Johnsgard 1973). Idaho Department of Fish and Game first introduced the ring-necked pheasant in Idaho In 1909 (Stephans 1908). Chukars were first introduced into Idaho in 1933. At Deadwood, the spruce grouse Is the principal upland game species present, although blue grouse and ruffed grouse also occur in the area (Cadwallader, IDFG, pers. commun.).

A pheasant model and a spruce grouse model were selected to evaluate the effects of the project on upland game bird habitats. The pheasant model was used to evaluate habitat at Black Canyon, while the spruce grouse model was used to evaluate the habitat at Deadwood. Pre- and post-constructlon population estimates were not available for either species.

Pre-construction Conditions

Upland game bird species present at Black Canyon, prior to inundation Included ring-necked pheasant and quail (Interview with J. Curtis by M. Buckendorf, unpubl. rep., ISHS and USBR). The quail present were probably bobwhite (Colinus virginianus) and/or mountaln quail. Columbian sharp-tailed grouse (Tympanuchus phasianellus columbianus) and sage grouse (Centrocercus urophaslanus) also probably occurred In the Black Canyon area before dam constructlon. The Black Canyon area was included In both species' original distribution in Idaho (Aldrich and Duvall 1955, Aldrich 1963). The mourning dove was also probably present. Chukars were introduced into Idaho after the dam was built. The gray partrldge was released into Idaho sometime between 1912 and 1920; therefore, they may or may not have been present near Black Canyon prior to inundation.

The riparian areas that existed along the Payette River probably provlded adequate cover for upland game bird species present at Black Canyon. The upland sagebrush habitat and farm lands, as well as the riparian areas, provlded abundant food sources such as weed seed, insects, wild fruits, and grain. Black Canyon provided steep, rocky riparian areas, preferred mountain quai I habitat.

Prior to Black Canyon Dam construction, the study area provided 1,784 acres of ring-necked pheasant habitat. The Interagency team of biologists estimated a 0.33 HSI. Therefore, the Black Canyon study area provided an estimated 589 HU's of ring-necked pheasant habitat.

Upland game birds present at Deadwood prior to dam construction included spruce grouse, blue grouse, and ruffed grouse (M. Koskella and L. Cox, pers. commun.). Blue grouse generally occupied the ridge-top areas, while ruffed grouse were generally In the river-bottom area (M. Koskella, pers. commun.). The spruce grouse was associated with evergreen forests in the area.

Prior to Deadwood Dam construction, the study area provided 3,423 acres of spruce grouse habitat. An HSI of 0.48 was estimated. As a result, the study area provided an estimated 1,643 HU's of spruce grouse habitat.

Post-construction Conditions

The same upland game bird species present prior to the construction of Black Canyon Dam are currently present, with the exception of sage grouse and sharp-tailed grouse. In addition, chukars Inhabit the sagebrush communities near the reservolr Chukars were first released by the IDFG into Gem County sometime between 1933-1950. The most successful pre-1950 release within the state was at the Squaw Butte-Black Canyon area In Gem County (IDFG 1946, IDFG 1950, Bizeau 1963). In 1948, the Black Canyon area, including the hills above Sweet and Ola, Dry Creek, and Pearl, had an estimated 6,OOO-8,000 chukars (IDFG 1948). Recently, captive chukars have been released near Regan's Butte, Squaw Creek, and Peterson Gulch (A. Ogden, IDFG, pers. commun.).

Currently, the Black Canyon study area provides 915 acres of pheasant habitat with an estimated HSI of 0.36. As a result, there are an estimated 329 HU's of pheasant habitat.

Deadwood Reservoir lnundated creek bottom areas used by ruffed grouse and spruce grouse and mlxed coniferous forest used by spruce grouse. The remaining trlbutary creek bottoms and lodgepole pine forest adjacent to the reservoir currently provlde habitat for grouse species present.

The Deadwood portion of the study area presently provides 682 acres of spruce grouse habitat with an estimated HSI of 0.34. Therefore, the study area provides an estimated 232 HU's of spruce grouse habitat.

Impact Assessment

Prior to construction, the Black Canyon study area provided 1,784 acres of ring-necked pheasant habitat, while it presently provides 915 acres. As a result, the following impact was estimated:

Ring-necked pheasant HU's

589	Pre-construction
329	Post-construction
-260	Change in ring-necked pheasant HU's

Prior to construction of the dams, the study area provided 3,423 acres of spruce grouse habitat at Deadwood, while It presently provides 682 acres. As a result, the following impact was estimated:

Spruce grouse HU's

1,643	Pre-construction
232	Post-construction
-1,411	Change In spruce grouse HU's

NONGAME WILDLIFE

Introduction

Many nongame species are present at Black Canyon (Appendix F) and In the Deadwood area (Appendix G). These species represent a large and Integral part of the biot ic community. They are important ecologically as primary and secondary consumers, as well as prey items for predators. They are also Important socially and economically because of the ever-increasing public awareness and appreciation of their existence.

The number of nongame species potentially affected was too large to evaluate each species individual ly. Three models were selected to evaluate the effects of project construction and operatlon on nongame wildlife.

The black-capped chickadee and yellow warbler models were chosen for the evaluation at Black Canyon. The black-capped chickadee model was selected to represent species associated with forested wetland habitats. The yellow warbler model was selected to represent wildlife species associated with scrub-shrub wetlands. Both models are used to evaluate habitats that are considered riparian communities Habitat components measured for the models are important to a wide variety of mammals, birds, reptiles, and amphibians.

The yellow-rumped warbler and yellow warbler models were chosen to evaluate the effects of dam construction and operatlon at Deadwood. Again, the yellow warbler model was selected to represent wildlife species associated with scrub-shrub wetlands. The yellow-rumped warbler model was selected to represent wildlife species associated with evergreen forest cover types (Append lx C).

Pre-construction Conditions

Early accounts of Black Canyon and Deadwood generally do not mention nongame species. Nongame species that are currently present probably occurred In the areas prior to inundation.

The Black Canyon study area had an estlmated 196 acres of forested wetlands. The black-capped chickadee model was used to evaluate the forested wetlands of the area in terms of tree height, tree canopy closure, and number of snags. Using the model, an HSI of 0.88 was estimated, for a total of 172 HH's for black-capped chickadees in the Black Canyon area.

The Black Canyon study area contained an estimated 24 acres of scrub-shrub wetland, while the Deadwood study area had an estimated 390 acres of scrub-shrub wetland. The yellow warbler model was used to evaluate this cover type in both study areas. Estimated HSI values for Black Canyon and Deadwood were 0.78 and 0.80, respectively, resulting in a total of 331 HU's for the yellow warbler.

The Deadwood study area had 3,357 acres of evergreen forest. Sampling resulted in an HSI of 0.98 and, therefore, an estlmated 3,290 HU's of yellow-rumped warbler habitat in the study area.

Post-construction Conditions

The project inundated over 1,057 acres of nongame wildlife habitat at Black Canyon, and 3,094 acres at Deadwood. The most significant losses occurred to those species associated with riparian communities and evergreen forests. Nearly all of the forested and scrub-shrub wetlands in both study areas were Inundated by the project.

Mostly as a result of sedimentation, the Black Canyon area presently provides 118 acres of forested wetlands and 34 acres of scrub-shrub wetlands. The forested wetlands provide an estimated HSI of 0.88 and 104 HU's of black-capped chickadee habitat. The scrub-shrub wetlands provide an estimated HSI of 0.78 and 27 HU's of yellow warbler habitat.

The Deadwood study area presently provides 4 acres of scrub-shrub wetlands and 678 acres of evergreen forest. The scrub-shrub wetlands provide an estimated HSI of 0.73 and 3 HU's of yellow warbler habitat. The evergreen forest provides an estlmated HSI of 0.98 and 664 HU's of yellow-rumped warbler habitat.

Impact Assessment

Although 4,151 acres of nongame habitat were directly affected by the project, impacts to nongame species were quantified only in forested and scrub-shrub wetlands and evergreen forest cover types. The study areas contained an estimated 232 acres of forested wetlands, 414 acres of scrub-shrub wetland and 3,321 acres of evergreen forest. Present I y, the study areas contain 118 acres of forested wetland, 38 acres of scrub-shrub wetland, and 678 acres of evergreen forest. The project resulted in estimated losses of 68 HU's for nongame species dependent on forested wetlands, 301 HU's for nongame species dependent on scrub-shrub wetlands, and 2,626 HU's for nongame species dependent on evergreen forests (Table 13).

Table 13. HU's for nongame evaluation species for Black Canyon and Deadwood study areas under pre and post-construction conditions.

	Forested wetland	Scrub-shrub wetland	Evergreen forest
	Black-capped chickadee	Yellow warbler	Yellow-rumped warbler
Black Canyon			
Pre-construction	172	19	
Post-construction	104	27	
Changes in HU's	-68	+8	
Deadwood			
Pre-construction		312	3,290
Post-construction		3	664
Changes in HU's		-309	-2,626
Total changes in HU's	-68	-301	-2,626

RAPTORS

Introductlon

Numerous raptor species occur in the Black Canyon area (Appendix F). Breeding birds along the Payette River near Black Canyon include the osprey, golden eagle, prairie falcon, short-eared owl, common barn-owl, and western screech-owl. Migratory and wintering species include the bald eagle.

Similar raptor species occur at Deadwood Reservoir (Appendix G). Bald eagles have been sighted near the reservoir In the spring (Cadwallader, IDFG, pers. commun.) and in the fal I (B. Martin, IDFG, pers. commun.). There are no known bald eagles nesting in the area. Ospreys nest on the west side of the reservoir (M. Miller, pers. commun.).

Pre-construction Conditions

Interviews with people who had worked or lived in the Black Canyon or Deadwood areas prior to dam construction revealed little information about the raptor species present. The species that are currently present in these areas were probably present prior to inundatlon. The population numbers of each species may have been affected by dam construction.

Post-construction Conditions

Wintering bald eagles presently use the Payette River upstream and downstream from Black Canyon Reservoir. Waterfowl are the main food source for eagles in this area. The reservoir generally freezes over in the winter, precluding waterfowl use. Waterfowl, however, do use the open water on the river above and below the reservoir (A. Ogden, IDFG, pers. commun.).

Bald eagles also use the Deadwood Reservolr area. Use generally occurs in the spring and fal I The reservoir freezes each winter, maklng fish inaccessible. Elk and deer migrate through during the spring and fall, but winter at lower elevations.

Impact Assessment

Prior to construction of the dams, the study areas provided 646 acres of wetland habitats, 4,479 acres of upland habitats, and 406 acres of agriculture/pasture habitats that were available for raptors. Present I y, there are only 163 acres of wetland, 1,306 acres of upland, and 128 acres of agriculture/pasture available to raptors.

Bald eagles winter on the Payette River upstream and downstream from Black Canyon Reservoir and on the South Fork of the Payette River downstream from Deadwood Dam. It is assumed the rivers within the present reservoir areas were used by bald eagles during winters prior to project construction, while winter use is now usually precluded by ice.

SUMMARY

The Black Canyon Project inundated a total of 4,151 acres as a result of the construction of Black Canyon and Deadwood dams. The impacts of the project were evaluated in a study area which included the dams, reservoirs, power plant staging areas, and the 100 meters adjacent to each reservoir.

All vegetation cover types identified within the study area were reduced as a result of the project except the herbaceous wetland type, which increased by 7 acres in the Black Canyon area (Table 10). Net losses included 78 acres of deciduous forested wetland, 36 acres of evergreen forested wetland, 376 acres of deciduous scrub-shrub wetland, 2,643 acres of evergreen forest, 530 acres of shrub-steppe (sagebrush-grassland), and 275 acres of riverine habitat.

The Habitat Evaluation Procedure (HEP) was used to evaluate the effects, in terms of habitat values, that the project had on the target species chosen. An interagency team of biologists selected models for each target species, and took field measurements to characterize habitat variables. With the HEP, net impacts are estimated in Habitat Units (HU's) a measure of quality and quantity of habitat available for an evaluation species. For a glven evaluation species, one HU is equivalent to one acre of prime habitat.

The study area contained 5,125 acres of big game habitat prior to construction of the dams, while it presently contains 1,469 acres. Using a mule deer model, a loss of 2,322 HU's was estimated. This was considered representative for all big game species affected by the project.

The study area contained an estimated 2,355 acres of aquatic furbearer habitat along 26.3 miles of river and tributaries prior to construction of the dams, while the reservoirs currently have 1,597 acres of potential shoreline habitat. As a result, a loss of 1,319 HU's was estimated for the mlnk. This is considered representative for other aquatic furbearers affected by the project, including river otter, beaver, and muskrat.

The study area contained 1,084 acres of suitable mallard and Canada goose habitat prior to the project, while it presently contains 466 acres. Hab i tat acres have been reduced, but habitat value Is currently higher. As a result, losses were estimated to be 270 mallard HU's and 214 Canada goose HU's. The mallard loss is considered representative for other breeding waterfowl species affected by the project.

The study area contained 232 acres of forested wetlands, 414 acres of scrub-shrub wetlands, and 3,321 acres of evergreen forest, while It presently contains 118 acres of forested wetlands, 38 acres of scrub-shrub wetland, and 678 acres of evergreen forest. A black-capped chickadee model was used to assess the habitat values of deciduous forested wetlands. A yellow warbler model was used to assess habitat values of scrub-shrub wetlands. A yellow-rumped warbler model was used to assess habitat values of evergreen forested wetlands and evergreen forests. Losses were estimated to be 68 HU's for species dependent on forested wetlands, 301 HU's for species dependent on scrub-shrub wetlands, and 2,626 HU's for species dependent on evergreen forests.

Table 14. Summary of wildlife habitat Impacts essoclated with construction and operation of the Black Canyon Project, Peyatte River, Idaho/

	Evaluation species								
	Mule deer	Mink	Mal lard	Canada Goose	Pheasant	Spruce grouse	Black-capped chickadee	Yellow warbler	Yellow rumped warbler
Black Canyon									
Pre-constructfon									
Hab i tat acres	1,378	1,084	1,084	1,084	1,784		196	24	
HSI	0.45	0.77	0.55	0.55	0.33		0.88	0.78	
HU's	620	835	596	596	589		172	19	
Post-construction									
Habi tat acres	787	915	466	466	915		118	34	
HSI	0.48	0.55	0.70	0.82	0.36		0.88	0.70	
HU's	376	503	326	362	329		104	27	
Impacts									
Habitat acres	-581	-168	-616	-618	-868		-78	+10	
HU's	-242	-332	-270	-214	-260		-68	+8	
Deadwood									
Pro-construction									
Habitat acres	3,747	1,271				3,423		390	3,357
HSI	0.97	0.83				0.48		0.80	0.98
HU's	2,510	1,055				1,643		312	3,290
Post-constructton									
Habi tat acres	682	682				682		4	678
HSI	0.83	0.10				0.34		0.73	0.98
HU's	430	66				232		3	664
Impacts									
Habi tat acres	-3,065	-589				-2,741		-386	-2,879
HU's	-2,080	-987				-1,411		-309	-2,826
TOTAL (HU'si	-2,322	-1,319	-270	-214	-260	-1,411	-68	-301	-2,828

The spruce grouse and ring-necked pheasant were selected to evaluate the project's impacts on upland game birds. Prior to construction, the study area contained 1,784 acres of pheasant habitat at Black Canyon and 3,423 acres of spruce grouse habitat at Deadwood. Presently, there are 915 acres of pheasant habitat and 682 acres of spruce grouse habitat. Therefore, the project resulted in estimated losses of 260 pheasant HU's and 1,411 spruce grouse HU's.

In general, raptors were negatively affected by the project by reductions in habitats. Bald eagle winter habitat was reduced as a result of the reservoirs freezing over, compared to the open-water riverine environment that existed prior to the project.

HYDROELECTRIC PORTION OF PROJECT'S IMPACTS

We feel that all wildlife and wildlife habitat losses identified as the result of the project should be attributable to the hydroelectric project purpose. We support the position forwarded from the Columbia Basin Fish and Wildlife Technical Committee to the Northwest Power Planning Council (letter of 12 December 1985):

> "In considering this issue, it is important to recognize that for power production a certain 'head' or water level is needed. Other uses remove or release water, but the water level needed for power production is maintained and coordinated in the Columbia River system. Consequently, we view the primary loss of habitat and wildlife attributable to hydropower as being that habitat eliminated by lnundatlon and fluctuation of pool and operating levels needed for power production, and the wildlife dependent on that habitat.
>
> "This is a somewhat simplistic approach and it does not consider secondary impacts. We believe, however, that it is a reasonable and realistic approach. This should be the basis for proposing mitigation. This will not provide 100% mitigation and asks only that ratepayers fund those direct impacts of hydropower development and operation."

Although there is no power plant at the Deadwood facility, It was authorized specifically for storage of water for power production at the Black Canyon power plant, and it was to be repaid exclusively from power revenues (USBR 1949).

CURRENT CONCERNS

Riparian plant communities (forested, scrub-shrub, and emergent wetlands) constitute less than 1% of the land surface of Idaho. Acre for acre, they are the most valuable fish and wildlife habitat. There is a concern for the quality and quantity of these habitats that are critical for waterfowl and aquatic furbearers and very important for bald eagles, mule deer, and many other species of game and nongame wildlife.

The Black Canyon area is relatively dry and has extensive acreages of sagebrush-grassland. In this type of area, reductions of riparian habitat adversely affect waterfowl, furbearers, bald eagles, and many other species of game and nongame wildlife. Mule deer winter primarily on sagebrush-covered hillsides, but riparian areas provide important habitat, especially during severe w inters. In the Deadwood area, riparian areas also provlde elk calving habitat, and reductions of those areas probably decrease herd productivity. Riparian habitats are important, but upland habitats also provide important habitat for many species.

For many social and economic reasons, there are needs to increase populations of big game, waterfowl, furbearers, game birds, nongame, and threatened and endangered species within the Payette River Basin. in order to meet these needs, the primary concerns are that important riparian and upland habitats be protected and improved for wildlife.

BOISE DIVERSION

PROJECT DESCRIPTION

Boise Diversion Dam is located on the Boise River about 4 miles southeast of the city limits of Boise, Idaho (Figure 9). The dam is a rubble-concrete, weir-type structure 68 feet high, with a crest length of 500 feet. The spillway is a concrete overflow section on the dam. The power plant has a capacity of about 1,500 kilowatts (USBR 1981b). At full pool, the reservoir is about 1.6 miles long and 115 yards wide. There were no wildlife mitigation measures identified in the mitigation status report for this project (Martin and Mehrhoff 1984).

The Boise Project, which includes the Diversion Dam, was initially authorized in 1905 by the Secretary of the Interior, under the Reclamation Act of 1902. Bids for constructing the power plant were requested in 1905 (USBR 1916). The dam was completed in 1908. It was built for irrigation diversion for the Arrowrock Division of the Boise Project (USBR 1916). The power plant was authorized by the Secretary of the Interior in 1911 to supply power for the construction of Arrowrock Dam (USBR 1957). The power plant began operating in 1912. For economic reasons, the plant has not been operated since 1982, although it can be restarted under short notice (J. Hansen, USBR, pers. commun.).

The Diversion Dam is supplied by water stored in Anderson Ranch, Arrowrock, and Lucky Peak Reservoirs. It has a diversion capacity of 2,815 cfs. Most water flows into the New York Canal, although some flows into the smaller Penitentiary Canal (USBR 1981b). The dam has no effect on flood control, except by reducing flows by the amount being diverted.

The spillway is operated as run-of-the-river. The dam impounds about 3,000 acre-feet from mid-April to mid-October. During that time, the pool elevation is about 20 feet higher than the river elevation during winter (J. Hansen, USBR, pers. commun.).

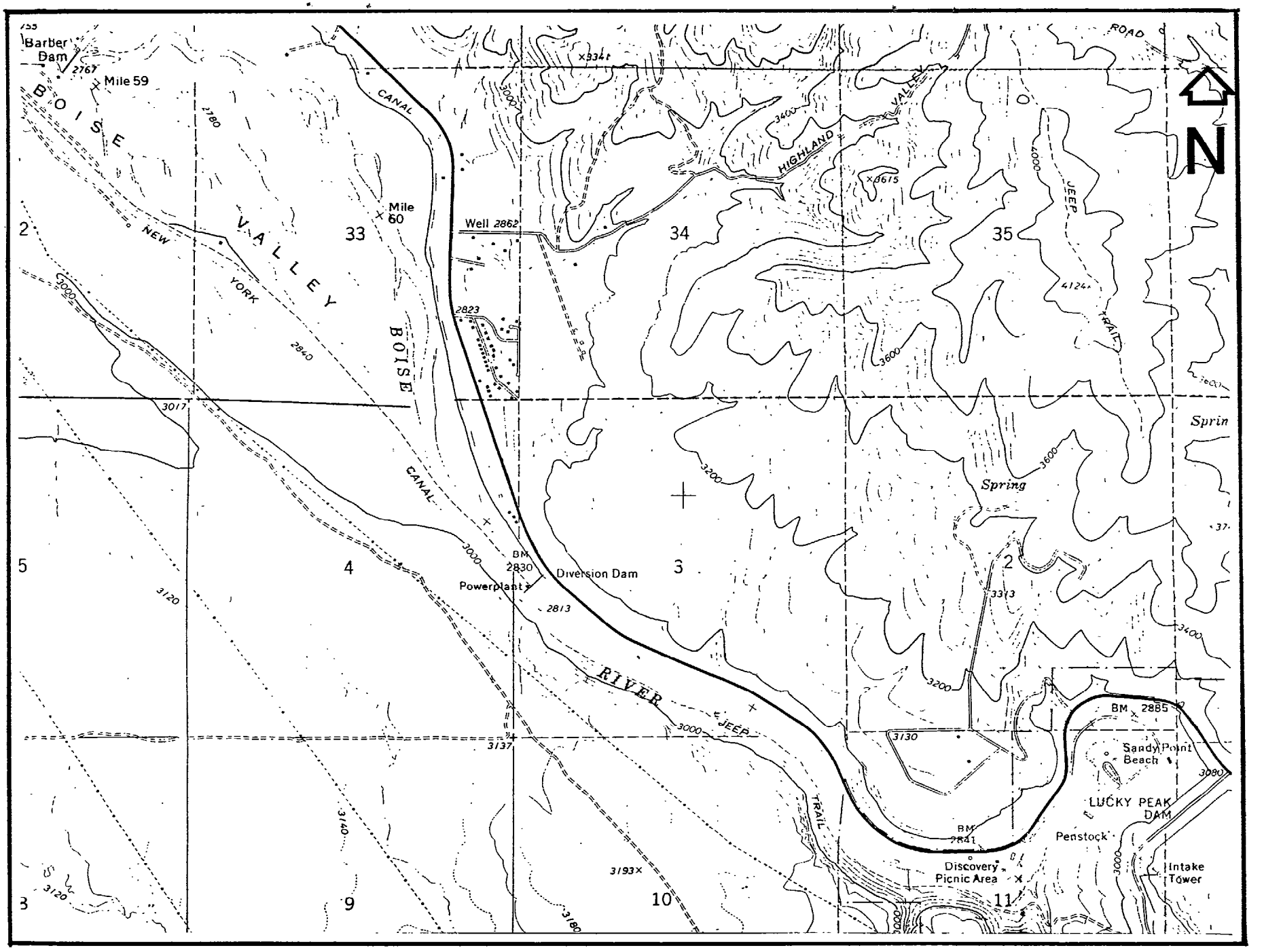


Figure 9. Post-construction map of the Boise Diversion Project and general vicinity.

STUDY AREA

The cl imate of the Boise River watershed is semi-arid with warm, dry summers and cold, wet winters. Annual precipitation near the dam Is about 14 inches. Temperatures range from an average annual maximum of 105° to an average annual min imum o f -1°F.

For the purposes of this impact assessment, the dam and the reservoir were considered project features that should be included in the study area. The Interagency team of biologists agreed that the appropriate method for evaluating the effects of hydroelectric development and operation of this project was to limit the study area to the high water line of the reservoir, and to evaluate habitat within this area under pre-construction and immediatley post-construction conditions.

METHODS AND MATERIALS

The Habitat Evaluation Procedure (HEPI developed by the USFWS (1980c) was used to evaluate the quality of wildlife habitat affected by the project. An interagency team of biologists selected five target species; habitat quality, based on selected models, was evaluated for four of the five target species. The bald eagle was not evaluated using HEP, but was considered an important species of the area. Each of these target species was chosen either because it Is of high priority according to state or federal programs, or because It Is an indicator species used to describe habitat conditions for other species with similar habitat needs.

Through correspondence and discussions with agencies and the Shoshone-Bannock Tribes, the following target species were agreed upon:

Spec ies	Reason for Selection
MU le deer	Important big game species.
Ma l lard	Indicator waterfowl species.
Mi nk	Indicator aquatlc furbearer species.
Yellow warbler	Indicator species f o r wildl ife associated with scrub-shrub wetlands.
Bald eagle	Important raptor species.

Species lists, population information, and vegetation descriptions were obtained from published documents when possible (Caldwell and Wells 1974, U.S. Army Corps of Engineers 1974, Sather-Blair and Blair 1983, Kading 1984). Additlonal information was obtained from interviews with wildlife and fishery professionals.

Vegetation mapping of the pre- and post-construction study area was done on black-and-white aerial photographs (scale 1:7,920). Cover types were mapped using a combination of historical information and oblique photographs of the dam site during construction.

In order to assess losses and/or gains in wildlife habitat as a result of the project, vegetatlon communities and land uses were assessed for the study area and vicinity Four cover types were identified:

Deciduous scrub-shrub wetland.- This cover type occurred In a narrow band along the river Presently, the scrub-shrub wetlands below the dam are dominated by willows. Other species Include red-osier dogwood, rose, nlghtshade, goldenrod, and rushes.

Shrub-steppe.- This cover type occurred on the slopes above the river. Presently, big sagebrush dominates, and bluebunch wheatgrass is the most common grass.

Riverine rock bottom.- This type describes the river channel prior to project construction.

Lacustrine open water. - This type Is the reservoir pool.

Habitat Evaluation Procedure

The yellow warbler and mink models are published and available from the USFWS (Schroeder 1983, Allen 1984). The mallard and mule deer models are developed but unpublished (Appendix A).

With the HEP, each species model uses a number of measurable variables that are combined into an equation which results In a sample site Habitat Suitability Index (HSI). The average HSI from all sample sites is used as the HSI value for a given evaluation species in the study area. This overall HSI is a number between 0 and 1.0. It is a quality index, or a measure of the capacity of the study area to meet the life requisites of the evaluation species.

A number of variables had to be measured for the selected evaluation species models. Habitat variables such as shrub heights, and shrub and herbaceous canopy cover were measured in the field. Three line transects of 100 feet each were randomly selected within each sampling area. Vegetation measurements were taken along these transects.

For each evaluation species, the overall HSI, when multiplied by the number of acres of habitat for those cover types needed by each species, yields the number of Habitat Units (HU's). This Is a measure of the quality and quantity of habitat available to the species. For a given evaluation species, one HU Is equivalent to one acre of prime habitat. The difference in HU's for each evaluation species between pre- and post-construction conditions represents the losses and/or gains of habitat In terms of quality and quantity as a result of development and operation of the project.

For all evaluations, field measurements In cover types adjacent to the reservoir were used as general guidelines for estimating habitat values. Habitat conditions visible on pre-construction photographs were the most Important factors used to estimate HSI's.

The sampling design for determining HSI's and HU's varied for each evaluation species:

Mule deer. - The scrub-shrub wetland and the shrub-steppe cover types within the reservoir area were evaluated as mule deer habitat.

Mallard. - One overall HSI value was estimated for the 1.6 mile long reservoir area. Only the river and scrub-shrub wetlands were evaluated as mallard habitat.

Mink. - One overall HSI value was estimated for the 1.6 mile long reservoir. Only the river and scrub-shrub wetlands were evaluated as mink habitat.

Yellow warbler. - The scrub-shrub wetlands within the reservoir area were evaluated for this species.

RESULTS

HABITAT AND LAND USES

Pre-construction Conditions

Publications listing the vegetatlon present in the Boise Diversion study area prior to inundation are not abailable. However, Caldwell and Wells (1974) listed the native vegetation that occurred in the lower Boise River Valley. Common vegetation communities present In the Boise Valley include big sagebrush-bluebunch wheatgrass, shadscale (Atriplex confertifolia), Sandberg bluegrass (Poa sandbergii) shortgrass, and Boise River riparian areas.

The reservoir covered 66 acres and 1.6 miles of river channel. Using available pre-construction photographs, the following acreages were estlmated for the reservoir area: scrub-shrub wetland, 6 acres; shrub-steppe, 22 acres ; river ine, 38 acres (Table 15; map located in Appendix B).

Domestic livestock grazing was the most extensive land use in the Boise Diversion area prior to dam construction (Caldwell and Wells 1974). Sheep, cattle, and/or horses grazed on most uncultivated lands in the basin and mountain areas. Grazing use began with early settlement and intensity of range use peaked by 1900 (Table 16). Early grazing took place on virtually all the uncultivated areas in the basin, as well as for short periods in the mountain areas.

Table 16. Estimated livestock grazlng use in the Boise Basin (Caldwell and Wel Is 1974).

Years	Animal Unit Months (AUM)
1870	230,000
1880	320,000
1890	420,000
1900	500,000
1910	429,000
1920	451,000
1930	269,000
1940	180,000

Post-construction Conditions

The Boise Diversion Reservoir inundated 66 acres of habitat and 1.6 miles of free-flowing river. Within the reservoir area, all 66 acres were converted to the lacustrine cover type.

Table 15. Cover type acreages In the Boise Diversion Study area for pre- end poet-construction conditions.

	Dec iduous scrub-shrub wet land	Shrub-steppe	Riverine rock bottom	Lacustrine open reter	Total
Pre-construction	6	22	38	0	66`
Post-construction	0	0	0	66	66
Nat gain or loss	-6	-22	-36	+66	

BIG GAME

introduction

The mule deer is the most important big game species in the Boise Diversion area. The land adjacent to Lucky Peak Reservolr, directly upstream from Boise Diversion Dam, is critical mule deer winter range. This deer herd is one of the most important in Idaho, in terms of hunter activity and harvest. As many as 6,000 deer have been taken from the Boise River management unit annually. Mule deer are also very common adjacent to the study area.

A mule deer model was selected to evaluate the effects of dam construction and operation on big game habitat. The mule deer is the only big game species that uses the study area, but the components measured for the model are important to other wildlife species that are associated with sagebrush communities. Examples of bird species associated with sagebrush communities are sage thrasher, chipping sparrow, loggerhead shrike, green-tailed towhee, and lark bunting. Reptiles associated with sagebrush communities include the western rattlesnake (Thamnophis elegans) and striped whipsnake (Masticoebis taeniatus). Pre- and post-construction population estimates, specifically for the Boise Diversion pool area, are not available.

Pre-construction Conditions

Prior to the presence of non-Indian people, deer herds migrated annually from the upper Boise River drainage, across the Boise Front to Deer Flats (now Lake Lowell) (Caldwell and Wells 1974). Presently, deer usually migrate only as far as the foothills northeast of Boise.

Other big game species were also historically present in the Boise Basin area. Pronghorns (Antilocapra americana) were common and occasionally must have moved from adjacent sagelands to the river for water. In 1824, Alexander Ross reported seeing both deer and elk herds using the Boise River bottoms (Caldwell and Wells 1974).

Mule deer habitat quality was evaluated for 6 acres of scrub-shrub wetland and 22 acres of shrub-steppe. Field measurements and pre-construction photographs indicated these 28 acres of mule deer habitat provided an estimated winter food HSI of 0.31. Due to near-zero average winter snow depths, a relatively moderate climate, and the presence of resident deer nearby, it was assumed winter cover requirements were met in the area. Therefore, mule deer habitat provided 9 HU's

Post-construction Conditions

Mule deer winter adjacent to the Boise Diversion area, as well as directly upstream near Lucky Peak Reservoir. There are also mule deer located directly downstream of the project, in the Barber pool area (Kading 1984). The Barber area supports about 40 resident mule deer, and an additional 50 to 100 deer during the winter (A. Ogden, IDFG, pers. commun.). On the slopes adjacent to the reservoir, groups of 10 or more deer have been seen on several occasions. The study area provides no habitat value for mule deer under post-construction conditions because the 66 acre study area was inundated by the project.

Impact Assessment

The study area provided 28 acres of mule deer habitat prior to project construct ion, and no habitat under post-construction conditions. As a result, the direct impact of the project, in terms of mule deer habitat, was estimated to be a loss of 9 HU's.

FURBEARERS

Introduction

Seven furbearer species occur in the general vicinity of the Boise Diversion project (Appendix H). Most of these are associated with aquatic and riparian habitats. Beaver and muskrats are primarily herbivores, feeding on plants associated with wetland habitats. River otters rely primarily on aquatic habitats (Toweill and Tabor 1982). Mink forage in wetland and upland vegetation for small mammals and birds as well as in aquatic habitats for fish (Appendix c). Bobcats are opportunistic feeders and subsequently use a diversity of habitats (McCord and Cardoza 1982). Raccoons are almost exclusively associated with riparian areas (Kaufmann 1982), whereas foxes prefer a diversity of habitats including riparian areas (Samuel and Nelson 1982). Pre- and post-construction population estimates for mink are non-existent.

A mink model was selected to evaluate and quantify the effects of the construction and operation of Boise Diversion Dam on aquatic furbearer habitat. The model is based on the quality of the aquatic habitat and a 100 meter band adjacent to the water's edge. Most of the furbearers present spend a majority of their time in the water and the area within 100 meters of the water.

Pre-construction Conditions

Caldwell and Wells (1974) summarized the animal species present in the Boise Basin prior to Boise Diversion Dam construction. Aquatic furbearers present included mink, beaver, and otter. Beavers were taken by trappers as late as 1910, and otters were taken occasionally along the Boise River. Other furbearer species such as raccoon, muskrat, and bobcat undoubtedly occurred in areas along the river, even though they were not mentioned in early accounts.

Suitable furbearer habitat occurred in the area inundated by the Diversion Dam. The river, scrub-shrub wetlands, and sagebrush provided moderate quality habitat for furbearer species. The rocky slopes and ledges adjacent to the project area prwided important habitat features for bobcats (McCord and Cardoza 1982).

Although the reservoir area prwided 66 acres of potential aquatic fur-bearer habitat, the area evaluated as mink habitat was limited to the 44 acres of river and scrub-shrub wetlands with in the reservoir area. For pre-construction conditions, it was estimated fran pre-construction photographs and field measurements that this area provided an HSI of 0.45 and, therefore, 20 HU's of mink habitat.

Post-construction Conditions

Currently, several species of furbearers use the area within the flood plain from Boise Diversion Dam through Eagle Island State Park. These species include muskrat, beaver, river otter, and mink. Otter numbers in the Boise River have declined due to loss of habitat (Sather-Blair and Blair 1983). Some raccoons and mink presently use Lucky Peak Reservoir, although there is

little evidence of muskrat and beaver (U.S. Corps of Engineers 1974). The following species occur in the Barber pool area: muskrat, beaver, mink, raccoon, and red fox (Kading 1984).

Few, if any, aquatic furbearers use the Boise Diversion pool or adjacent habitats. During winter months, a denuded shoreline, caused by annual water fluctuations and extensive sand accumulations, provides almost no security cover near the water's edge. Fish species, a food source for mink and river otters, have been nearly ellminated from the area as a result of the project (W. Reid, IDFG, pers. commun.). Due to these habitat conditions, the reservolr and its shoreline were not considered to provlde aquatic furbearer habitat suitable for evaluation.

Impact Assessment.

Prior to project construction, the reservoir area provided 66 acres of aquatic furbearer habitat, but only the 44 acres of river and scrub-shrub wetland were evaluated. This area was estimated to provide 20 mink HU's A denuded shoreline during winter, extensive sand accumulations, and the reduction of fish in the pool have resulted In little or no habitat values for aquatic furbearers under post-construction conditions. As a result, the impact of the project in terms of mink habitat was estimated to be a loss of 20 HU's. This is considered representative for the other aquatic furbearers affected by the project.

WATERFOWL

Introduction

At least 23 species of waterfowl occur on the Boise River downstream from the project area (Appendix H). Resident or breeding waterfowl on the Boise River include mallard, common merganser, green-wlnged and cinnamon teal, wood duck, pied-billed grebe and Canada goose. Most of the other species present are migrants.

A mallard model was selected to evaluate and quantify the effects of dam construction and operation on waterfowl habitat. Pre- and post-construction popu l at ion estimates, specifically for Boise Diversion, are non-existent.

Pre-construction Conditions

Early accounts of birds do not refer to waterfowl species (Caldwell and Wells 1974). Potential waterfowl nestlng sites may have been limited. Mallards build their nests In relatively tall vegetation, generally within 100 meters of water (Bellrose 1976). Adequate cover may have been limited near the river's edge as a result of grazing and annual spring run-offs. High flows probably scoured the vegetation adjacent to the river. Sect ions of the river may have provided loafing and feeding areas.

The 66 acres of the reservoir area provided potential waterfowl habitat. However, only the 44 acres of river and scrub-shrub wetlands were evaluated as mallard habitat. An HSI of 0.18 was estimated from pre-construction photographs. Therefore, the area evaluated was estimated to provide 8 HU's of mallard habitat.

Post-construction Conditions

Currently, the reservoir provldes only limited value as resting habitat. The primary species seen in the pool is the common merganser. The reservoir was not considered suitable for evaluation as mallard habitat under post-construction conditions because the project inundated the small acreage of scrub-shrub wetland that had been present in the study area.

Impact Assessment

Prior to project construction, the reservoir area provided 66 acres of potential waterfowl habitat, but only the 44 acres of river and scrub-shrub wetland were evaluated. Under pre-construction conditions, this area was subjected to high spring flows, and was probably of marginal value for nesting waterfow l. As a result, an HSI of 0.18 was estimated, so the 44 acres evaluated provided 8 HU's of mallard habitat. Under post-contruction conditions, the study area provides only marginal resting habitat. As a result, the impact in terms of mallard habitat was estimated to be a loss of 8 HU's . This is considered representative for other breeding waterfowl affected by the project.

RAPTORS

I ntroduct ion

At least 20 raptor species occur in the general vicinity of Diversion Dam (Append ix H). Winterlng birds include bald eagle, goshawk, sharp-shinned hawk, northern pygmy-owl, and northern saw-whet owl. Most of the other species present are either residents or breeders.

There are several species of special interest present. The bald eagle is federally listed as an endangered species, and Swainson's and ferruginous hawks are "category 2 species candidates" for federal status of threatened or endangered. The bald eagle and ferruginous hawk are also listed as "sensitive species" by the U.S. Fish and wildlife Service in Idaho.

Pre-construction Conditions

Early accounts of birds in the Boise Basin area generally do not mention raptor species (Caldwell and Wells 1974). However, there are historical accounts of bald eagles along the Boise River as early as the 1880's (Green 1978). Other raptor species undoubtedly also occurred along the Boise River. Wintering bald eagles probably used the area.

Post-construction Conditions

Currently, the Boise River upstream from Boise, Idaho, provides the requlrements of open water, suitable perch and roost sites, and adequate prey for wintering bald eagles (Steenhof et al. 1980, Appendix C). Reynolds et al. (1985) conducted a study during the winter of 1982-83 to assess wintering bald eagle populations along the Boise River. Eagles preferred Barber pool during late December and early January. Thereafter, most sightings occurred directly downstream of Lucky Peak Dam, near or in the study area. By mid-March, a minimum of 4 bald eagles were observed between Diversion and Lucky Peak Dams, and a maxlmum of 6 bald eagles were observed in the Diverslon pool area. A. Ogden (IDFG, pers. commun.) has observed as many as 20 bald eagles using the area between the city of Boise and Lucky Peak Dam.

Fish are now flushed out of Lucky Peak Reservoir, providing a food source for bald eagles in and upstream of the Diversion pool. Fish may be stunned as they come out of the dam, increasing their vulnerability to bald eagle predation. Bald eagles are often seen foraglng in the Diverslon pool area (S. Sather-Blair, USFWS, pers. commun.).

Prairie falcons (Falco mexicanus) and golden eagles (Aquila chrysaetos) have been sighted near the Boise Diversion area. Both species nested on both the canyon walls above the pool until recently (Woodworth 1986b).

Impact Assessment

The construction and operation of Boise Diversion Dam resulted In the loss of small acreages of riverine and wetland habitats, and caused sediment accumulations that have nearly eliminated fish populations in the pool area. However, these adverse Impacts may be offset by the good slow-water fishing conditions, prwided by the pool, that help eagles take advantage of the stunned fish caning out of Lucky Peak Dam.

OTHER WILDLIFE SPECIES

introduction

Many nongame species not previously mentioned occur in the general vicinity of the Boise Diversion (Appendix H). At least 150 nongame biard species are present in the Boise River area. Upland game birds present Include California quail, chukar, and rlng-necked pheasant. About 40 species of smal l mammals, 7 species of predators, and 14 species of reptiles and amphibians also occur along the Boise River (Sather-Blair and Blair 1983).

Most nongame species, as wel l as game species, depend on or prefer riparian habitats. Numerous studies have found higher species diversity and animal numbers in riparian habitats, as compared to adjacent upland habitats (Asherin and Claar 1976, Asherin and Orme 1978, Thomas et al. 1979, Cadwallader 1980). Predators generally prefer areas with higher prey densities.

A yellow warbler model was selected to evaluate the impact of the project on wildlife associated with scrub-shrub wetlands. Habitat components measured for the model are Important to a wide variety of mammals, birds, amphibians, and reptiles.

Pre-construction Conditions

Early accounts of wildlife species in the Boise River Valley were summarized by Caldwell and Wells (1974). Representatives of the weasel family included the short-tailed weasel (Mustela erminea), spotted skunk (Spilogale graci l is), striped skunk (Mephitis mephitis) and badger (Taxidea taxis). Native canids present were the coyote (Canis latrans) and red fox.

Little Information Is available on the presence of small mammal species prior to construction of the Boise Diversion Dam (Caldwell and Wells 1974). The region probably supported several species of ground squirrels (Spermophilus spp.). There were once large populations of other small mammals such as kangaroo rat (Dipodomys ordii) deer mouse (Peromyscus maniculatus), montane meadow mouse (Microtus montanus), and desert wood rat (Neotoma lepida). Early travelers commented on the large numbers of "rabbits", probably black-tailed jackrabbits (Lepus californlcus). Native rabbits probably also occurred.

Early accounts of birds In the Boise River Valley mention only upland game bird species. Quail and grouse occurred along the Boise River. Native species included sharp-tailed grouse and sage grouse. Mountain quail may have also been present, but may or may not be native to western Idaho (Ormiston 1966, Johnsgard 1975). Ruffed grouse may have existed in thickets along the river (Caldwell and Wells 1974).

it was estimated that prior to the project the reservoir area provided 6 acres of scrub-shrub wetlands. An HSI of 0.76 was estimated for this area. Therefore, the reservoir area provided 5 HU's for nongame species dependent on scrub-shrub wetlands.

Post-construction Conditions

Numerous wildlife species are associated with shrub-scrub communites. Nesting birds include the yellow warbler, yellow breasted chat, song sparrow, red-winged blackbird, black-billed magple, and California quail. Wintering and/or migrating birds include dark-eyed junco, white-crowned sparrow, ruby-crowned kinglet, and several species of warblers. Most of the small mammals, amphibians, and reptiles present in the forested wetland habitats are also present in the shrub-scrub areas, along with their predators.

Sather-Blair and Blair (1983) summarized current avian and mammalian use along the Boise River by cover type. During a given year, at least 100 bird species use the forested wetlands on the Boise River. Resident species include the black-billed magpie, California quail, northern flicker, black-capped chickadee and American robin. About 40 nesting bird species also use these forested areas and include the residents previously mentioned, woodpeckers, and house wrens. Wintering and migrant birds present include several species of warblers, vireos, and flycatchers.

The study area provides no habitat values for yellow warblers and other scrub-shrub wetland nongame species under post-construction conditions because the 66 acre study area was inundated by the project.

Impact Assessment

The study area provided an estimated 6 acres of moderately high value scrub-shrub wetlands prior to project construction, and no wetland habitat under post-construction conditions. Therefore, it was estimated the project resulted in a loss of 5 HU's for species dependent on scrub-shrub wetlands.

SUMMARY

The Boise Diversion inundated an estlmated 66 acres of wildlife habltats which included 6 acres of scrub-shrub wetland, 22 acres of shrub-steppe, and 38 acres of riverine habitat. The project converted 1.6 miles of free-flowing river into a 3,000 acre-foot reservoir operated as run-of-the-river for 6 months each year, and drawn down 20 feet the remainder of most years.

The HEP was used to evaluate the Impacts of the project on wi Idl ife habitats under pre- and post-construction conditions. Five target species were chosen either for their Importance in regional management, or as species to represent other wildlife with similar habitat needs. For all target species except the bald eagle, project Impacts were evaluated In terms of Habltat Units (HU's), a measure of quantity and quality of available habitat. For a given evaluatlon species, one HU Is equivalent to one acre of prime habitat.

The reservoir area contained 28 acres of big game habitat (Table 17) that were evaluated with a mule deer model. Prior to project construction, big game habitat In the reservoir area was estimated to provide a Habitat Suitablility Index (HSI) of 0.31 for mule deer. Therefore, the project resulted in an estimated loss of 9 HU's of mule deer habltat. This loss Is consldered representatlve for other sagebrush-associated species in the study area.

The reservoir area contained 66 acres of potential aquatic furbearer habitat prior to project construction, but only the 44 acres of riverine and scrub-shrub wetlands were evaluated as mink habitat. The reservoir area was estlmated to provide little or no habitat value under post-construction conditions. Uslng the mink model, an HSI of 0.45 was estimated for pre-construction conditions. Consequently, the project resulted In an estimated loss of 20 HU's of mink habitat. This loss is consldered representative for other aquatic furbearers Including the muskrat, beaver, and river otter.

Prior to construction, the reservoir area contained 66 acres of potential waterfowl breeding habitat, but only the 44 acres of river and scrub-shrub wetlands were evaluated as mallard habitat. The reservoir area was estimated to provide no suitable nesting habitat under post-constructlon conditions. Uslng the mallard model, an HSI of 0.18 was estimated for pre-construction conditions. Therefore, the project resulted in an estimated loss of 8 HU's of mat lard habitat. This is consldered representative for other breedlng waterfowl.

The reservoir area contained an estimated 6 acres of scrub-shrub wetlands prior to project construction, while under post-construction conditions, only water occurs within the reservoir area. Using the yellow warbler model, an HSI of 0.76 was estlmated for pre-construction conditions. As a result, the project caused an estimated loss of 5 HU's of yellow warbler habitat. This Is considered representative for all species dependent on scrub-shrub wetlands.

Table 17. Summary of wildlife habitat impacts associated with construction and operation of the Boise Diversion Project, Boise River, Idaho.

Group (Evaluation species)	Pre-construction			Poet-conetructlon		Impacts	
	Habitat acres	HSI	HU's	Hebitat acres	HU's	Habitat acres	HU's
Bif game							
Mule deer	26	0.31	9	0	0	-26	-9
Aquat ic furbearers							
Mink	44	0.45	20	0	0	-44	-20
Waterfowl							
Mallard	44	0.18	8	0	0	-44	-8
Nongame species							
Yellow warbler	6	0.76	5	0	0	-6	-5

HYDROELECTRIC PORTION OF PROJECT'S IMPACTS

We feel that all wildlife and wildlife habitat losses identified as the result of the project should be attributable to the hydroelectric project purpose. We support the position forwarded from the Columbia Basin Fish and Wildlife Technical Committee to the Northwest Power Planning Council (letter of 12 December 1985):

> " we view the primary loss of habitat and wildlife attributable to hydropower as being that habitat eliminated by inundation and fluctuation of pool and operating levels needed for power production, and the wildlife dependent on that habitat. "

CURRENT CONCERNS

Riparian plant communities (forested, scrub-shrub, and emergent wet l ands) constitute less than 1% of the land surface in Idaho and, acre for acre, they are the most valuable fish and wildlife habitat. In the Boise Diverslon area, there is a concern for the quality and quantity of these riparian habitats that are critical for waterfowl and aquatic furbearers and very important for bald eagles, mule deer, and many other game and nongame species.

There is also a concern for the quality of mule deer winter range in the area. Thousands of mule deer winter in the general vicinity, and, consequently, quantity and quality of mule deer winter range is considered to be very important.

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APPENDIX A

Unpublished Evaluatlon Species Models used in Impact Assessments for the Anderson Ranch, Black Canyon, and Bolse Diversion Projects In Idaho.

Mule deer
Mal lard
Canada goose
Ring-necked pheasant
Ruffed grouse
Spruce grouse
Yellow-rumped warbler

Habitat Suitability Index (HSI) Model for the Mule Deer

General Information

Species Information

Species:	Mule Deer (*Ococoileus hemionus*)
Habitat Use Pattern:	Multicover type user
Status:	Resident (seasonal migrant)
Cover Types:	All
Ecoregion:	M3113
Model Type:	Uncalibrated Index Model for Winter Range

Threshold Range Size. Information on the minimum size of suitable habitat that must be present before an area will be occupied by a population of mule deer was not found in the literature.

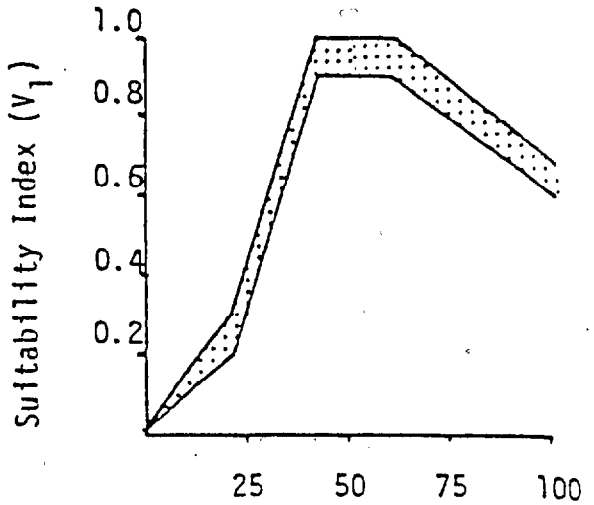
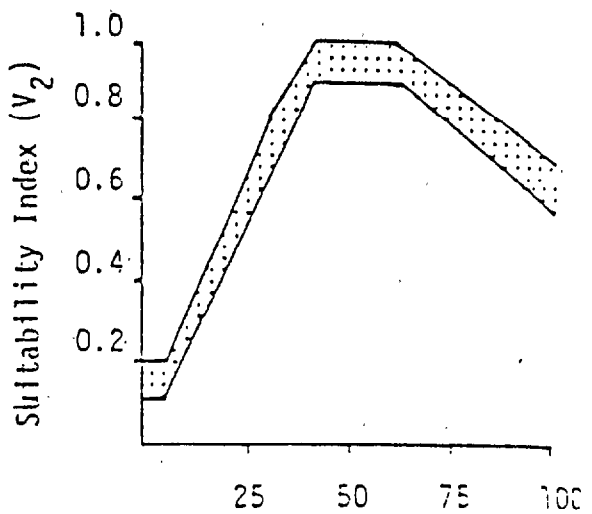
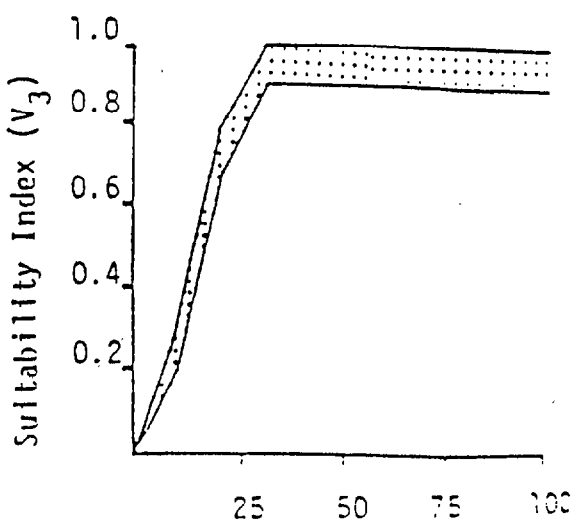
Home Range Data. Winter home range size for mule deer has been estimated to have a radius ranging from 0.4 to 1.2 km.

Habitat Composition. Habitat composition information for species which are multicover type users is most useful when presented in terms of life requisite needs. Optimal life requisite composition may be determined by considering the composition of the habitat in terms of cover types and by considering what life requisites are provided by each cover type. The following percentages were estimated based on the assumption that food should be available over a larger area than cover to provide optimal winter habitat.

Life Requisite	Optimal Percentage Estimate
Food	60%
Water	Assumed not to be limiting on winter range.
Cover	40%

Evaluation Criteria

Winter Food Value. Browse often furnishes 75% or more of the mule deer's winter diet. Forbs and grasses are supplemental winter foods and their availability will result in an increased food value for mule deer.

Variable		Suitability Index Curve
[V_1]	% shrub crown cover ≤ 1.5 m (5 ft) in height. (Do not consider small conifers as shrubs.)	
[V_2]	% shrub crown cover of preferred shrubs ≤ 1.5 m (5 ft) in height. (Preferred shrubs include, but are not limited to, antelope bitterbrush, mountain mahogany, ceanothus, chokecherry, and serviceberry.)	
[V_3]	% herbaceous canopy cover.	

Winter Food Value in all cover types is a function of V_1, V_2, and V_3. V_1 and V_2 are interactive variables and compensations exist between them. The abundance of shrubs and the availability of preferred shrubs are the most important components of the food value for winter range and have been weighted accordingly. The suggested function is:

$$\frac{3(V_1 \times V_2)^{1/2} + V_3}{4}*$$

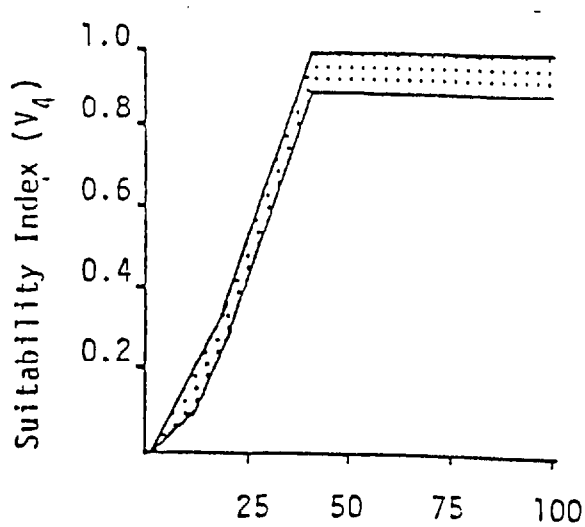
*When evaluating food on winter range the average snow conditions for the area must be taken into consideration. If the average depth of snow on the ground exceeds 60.9 cm (24 in) for extended periods of time, the life requisite value for food should equal zero. If persistent snow cover ranges from 30.4 cm (12 in) to 60.9 cm (24 in), the life requisite value should be adjusted downward. In determining winter snow conditions consider snowfall records, slope, aspect, wind, and vegetative cover.

Cover Value. Excellent winter habitat for mule deer has been characterized as being comprised of approximately one-half shrub cover types and one-half timbered cover types.

Variable

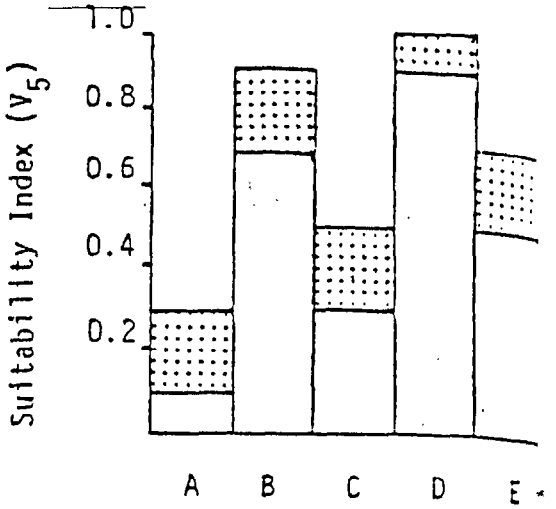
[V_4] % canopy cover of evergreen woody vegetation $\geq$ 3.0 m (10 ft) in height.

Suitability Index Curve



[V_5] Topographic diversity (consider entire project area).

A) Level terrain (0-5% slope), flat or nearly so, little to no physical diversity.
B) Level terrain (0-5% slope), area broken by drainages.
C) Rolling terrain (5-25% slope).
D) Rolling terrain (5-25% slope), ridges, rims and/or drainages present.
E) Mountainous (> 25% slope).



Cover Value in all cover types is a function of V_4 and V_5. V_4 and V_5 are interactive and compensations exist between them. The life requisite value will be zero only if both variables are equal to zero. The suggested function is:

$$\frac{2V_4 + V_5}{3}$$

HSI Determination for Multicover Type Users. The following is an abbreviated step by step discussion of HSI determination for multicover type species.

Step 1 - Determine Suitability Indices for each variable based on field data.

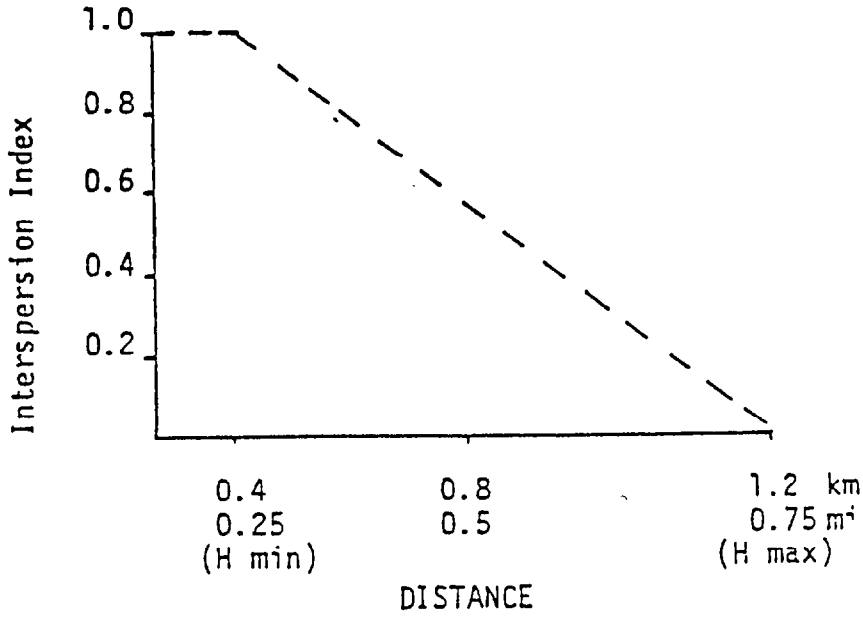
Step 2 - Compute Life Requisite Values for the indicated cover types using the suggested functions provided in the model.

Step 3 - Determine if all life requisites can be provided considering all cover types within the study area. If any life requisites are missing, the HSI will equal zero and no further evaluation is necessary.

Step 4 - Using the life requisite values computed in Step 2, the next step is to determine the spatial relationship of cover types providing various life requisites. Life requisite values may need to be adjusted to varying degrees depending on the distances separating them and how the distances compare with the species minimum and maximum home ranges. This step is accomplished as follows:

a) Determine the mean distance (measured from randomly selected points) from each cover type missing a life requisite to the edge of the next nearest cover type that provides the missing life requisite(s).

b) Incorporate the mean distance measurements from Step 4a into the x-axis of the home range-interspersion graph presented below. Determine where the mean distance measurement intercepts the graph and obtain the interspersion index by reading the corresponding value from the y-axis.



c) Multiply the interspersion index for each cover type determined in Step 4b by the life requisite values determined in Step 2. The products are the modified life requisite values.

Step 5 - Determine the relative abundance (in percent) of cover types used by the species within the study area, as follows:

$$\text{Relative Area for Cover Type A} = \frac{\text{Area of Cover Type A}}{\text{Total Area of all Cover Types used by the Species}} \times 100$$

Be certain that you consider only those cover types used by the species in determining relative area of cover types.

Step 6 - Determine the percent life requisite support provided by the available habitat as follows:

a) For each life requisite within each cover type, multiply the modified life requisite value(s) (Step 4c) by the relative area of that cover type (Step 5). The products equal the percent life requisite support provided by each cover type.

b) Sum the products from Step 6a for each life requisite. The total equals the percent life requisite support provided by the available habitat.

Step 7 - For each life requisite, divide the percent life requisite support (Step 6b) by the optimal percent life requisite estimate provided in the General Information section of the HSI Model (use the lower percentage where a range of percents are given as estimates for optimal life requisite percent). This yields the overall life requisite values for the entire study area.

Step 8 - The Habitat Suitability Index (HSI) is the lowest of the overall life requisite values.

Model Assumptions and Limitations. It is assumed in this model that the availability of free water will not be limiting on mule deer winter range. It is also assumed that average annual snowfall data will be available for the area (or immediate geographic region) under evaluation and that the influence of snow conditions can be directly related to the value calculated for food. It is assumed that the food value for the mule deer can be estimated without a precise volume measurement or assessing vegetative productivity, by estimating the approximate standing crop of vegetation. A further assumption is that the home range data can be used to assess spatial relationships of food to cover.

The major limitation in this model is that optimal life requisite composition values and the interspersion graph are best estimates derived from literature reviews. The estimates presented may not be valid in every situation.

MALLARD

HABITAT EVALUATION CRITERIA

Food - Evaluate food primarily using the criteria listed below. Mallards usually feed in open, shallow water; however, grain crops can suplement a natural diet substantially if they occur within close proximity to water, especially in winter. The amount of waste grain available will effect winter food value.

C1 = Summer Food Value is a function of:
The percent of available water that is slow moving, shallow, and open enough to allow a dabbling duck to feed.

a. 75-100% ..... (0.8-1.0 SI)
b. 25-75% ..... (0.4-0.7 SI)
c. 25% ..... (0.1-0.3 SI)

Cover - Evaluate cover primarily using the criteria listed below. Broods are most susceptible to predation when escape cover is lacking. Sufficient amounts of aquatic vegetation supply necessary escape cover.

C3 = Summer Cover Value is a function of:
Percent of shoreline dominated by emergent or scrub-shrub vegetation.

a. 50-100% ..... (0.7-1.0 SI)
b. 15-50% ..... (0.4-0.6 SI)
c. 0-15% ..... (0.1-0.3 SI)

Reproduction - Evaluate reproduction primarily using the criteria listed below. The abundance and patchiness of dense nesting cover (DNC) and the suitability of available water will largely influence reproductive value. Suitability of DNC increases with height.

C4 = Reproductive Value is a function of:
The distance between water bodies suitable for brood rearing and dense herbaceous cover at least 20 cm (8 inches) tall.

a. Immediately adjacent to each other ..... (0.9-1.0 SI)
b. 10-90 m ..... (0.6-0.8 SI)
c. > 90 m ..... (0.1-0.5 SI)

Interspersion - The mallard utilizes a variety of wetland types and habitat features for various life functions. Optimal mallard habitat will contain a variety of wetland types and sizes within close proximity. The lack of several wetland types can be compensated for by a diversity in physical composition. Evaluate interspersion value primarily using the criteria listed below. Sum the values of cover types or habitat features present to get the Interspersion HSI.

C5 = Interspersion Value is a function of:
The number and quality of wetland types and habitat features present within a 1 mile radius.

Braided channels.....	0-0.30
Emergent wetland.....	0-0.15
Deciduous wetland.....	0-0.15
Shallow, slow moving water.....	0-0.15
Tributaries.....	0-0.15
Islands.....	0-0.15

Model Equation:

C_1 = Food suitability index.

C_3 = Summer cover suitability index.

C_4 = Reproductive suitability index.

C_5 = Interspersion suitability index.

HSI for sample site = $(C1 \times C3 \times C4 \times C5)^{1/4}$

CANADA GOOSE MODEL

This model was developed by Dave Lockman, Wyoming Game and Fish Department; Mike Whitfield, U.S. Forest Service; Bob Jones, Bureau of Land Management; and Chuck Solomon, U.S. Fish and Wildlife Service. It was developed to describe the quality of goose breeding habitat along the Snake River prior to impoundment, as well as current conditions at Palisades Reservoir. The model recognizes that the presence of islands, the quality of shoreline habitat, and the accessibility and quality of brood-rearing habitat are the most important components determining the quality of Canada goose breeding habitat.

Islands (V^1)	SI Value
Stable islands present; islands have relatively high shoreline/area ratio; cover indicative of stability; ground cover on portions of island 4-8 inches high; adjacent water velocity low.	0.8-1.0
Stable islands present; relatively low shoreline/area ratio; cover on island < 4" or > 8"; adjacent water velocity high.	0.5-0.7
No stable islands, or islands with limited or no cover adjacent water velocity high.	0.0-0.4
Shoreline Habitat (V_2)	
Portions of cover within 10 meters of water; ground cover 4"-8", wetland buffer within 50 meters of shoreline, may include open water.	0.5
Portions of shoreline cover within 10 meters of water; over 4"-8"; adjacent wetlands within 50M of shoreline (does not include open water, rather forested or emergent wetlands).	0.3-0.4
No shoreline cover, or shoreline cover taller than 10" and/or very dense; buffer < 50 meters to absent.	0.1-0.2
Brood Rearing Habitat (V_3)	
Easy accessibility from main river system foraging zones with 10 meters of emergent vegetation or permanent cover ≥ 12" tall; foraging zones (vegetation ≤ 4" tall) average more than an acre in size and total to ≥ 60 acres or more per mile of river; open water wetlands within 25 meters.	0.7-1.0
As above, but no open water wetlands (palustrine or lacustrine) near area.	0.4-0.6
Little to no brooding area.	0.0-0.3

Model Equation

$$HSI = \frac{(V_1 \text{ or } V_2) + V_3}{2}$$

Reproduction value equals V_1 or V_2, whichever one has highest SI value.

Pheasant Model

HABITAT EVALUATION CRITERIA

Food - Related primarily to the abundance and availability of grain crops; weedy fields, roadside vegetation, or field edges may compensate for a lack of grain crops. Evaluate food primarily by using the following criteria.

Food Value is a function of:

[IC_1] The availability of grain and weed seeds within 1.6 km of sample site (consider year-round food availability).

a) Grain and weed seeds abundant and readily available . . . . . (0.8-1.0 rating)

b) Grain and'weed seeds scattered and not abundant (consider value of compensating food sources, as described above) . . . . . (0.3-0.7 rating)

c) Grain and weed seeds scarce or not available (e.g., as a result of prevailing agricultural practices) (consider value of compensating food sources, as described above) . . . . . (0.0-0.2 rating)

Food Value = _____

Cover - Winter cover is most limiting to pheasants. It is presumed that summer cover in seasonal herbland is not limiting. Evaluate winter cover primarily by using the following criteria.

Cover Value is a function of:

[IC_2] The distance to the nearest scrubland with dense woody ground cover, or the nearest treeland with dense woody ground cover, or the nearest dense, tall (>37.5 cm), and winter persistent herbaceous veaetation.

a) Less than ¼ mile ..... (0.9-1.0 rating)

b) ¼ to 1 mile ..... (0.4-O-8 rating)

c) Greater than 1 mile ..... (0.0-0.3 rating)

Cover Value = _____

Reproduction - Evaluate reproductive value primarily by using the following criteria.

Reproductive Value is a function of:

[IC_3] The type of seasonal herbland being evaluated (Note: If ditches, field borders, or roadside edges are not burned or mowed, the resulting nesting cover may compensate for otherwise low reproductive value).

a) Seasonal herbland that is not mowed, plowed grazed, or flood irrigated during pheasant nesting season (late May to mid-July) . . . . . (0.8-1.0 rating)
b) Seasonal herbland that is mowed, plowed, grazed or flood irrigated during the nesting season, but not until after July 1 . . . . . (0.4-O-7 rating)
c) Seasonal herbland that is moderately grazed throughout the nesting season . (0.2-O-5 rating)
d) Seasonal herbland that is heavily grazed throughout the nesting season, or is mowed, plowed, or flood irrigated between late May and July 1 . . . . . (0.0-O-l rating)

[IC_4] The herbaceous canopy cover (estimated for late May to mid-July).

a) 50-80% . . . . . (0.8-1.0 rating)
b) Greater than 80% or between 20% and 50% . . . . . (0.3-0.7 rating)
c) Less than 20% . . . . . (0.0-0.2 rating)

[IC_5] The average height of herbaceous vegetation (estimated for late May to mid-July).

a) Greater than 45 cm . . . . . (0.7-1.0 rating)
b) 25-45 cm . . . . . (0.2-0.6 rating)
c) Less than 25 cm . . . . . (0.0-0. 1 rating)

Reproductive Value = _____

Interspersion - Evaluate interspersion value primarily by using the following criteria.

Interspersion Value is a function of:

[IC_6] The abundance of edges between feeding areas (weedy fields, grain fields) and cover areas (treeland, scrubland, or fencerows with dense woody ground cover, or dense and tall herbaceous vegetation)

a) Feeding and cover areas well interspersed throughout area in small blocks; edges abundant . . . . . (0.8-1.0 rating)

b) Either feeding areas or cover areas are present as large units; amount of edge considerably less than choice (a) ..... (0.3-0.7 rating)

c) Both feeding areas and cover areas occur as large units; amount of edge is minimal ..... (0.0-0.2 rating)

Interspersion Value = _____

Other Considerations

In addition to those inventory characteristics identified as being important for the ring-necked pheasant, there may still be other pertinent evaluation criteria obvious only at an on-site inspection. All criteria identified as being unique to a specific site must be incorporated (and documented) into the appropriate life requisite category as each situation dictates, and considered when determining the HSI.

If any criteria listed are not applicable in a particular situation, dc not use in determining the life requisite value or the HSI.

HABITAT SUITABILITY INDEX

Ruffed Grouse in Tree-dominated Wetland

Ecoregion 2410

<u>Food Value</u> (X_1) = I_7

<u>Cover Value</u> (X_2) = $(I_1 \times I_2 \times I_5 \times I_6)^{1/4}$

<u>Reproductive Value</u> - Drumming (X_3) = $(I_1 \times I_4)^{1/2}$

<u>Reproductive Value</u> - Brood (X_4) = $(I_3 \times I_5)^{1/2}$

<u>Interspersion Value</u> (X_5) = I_5

Where: I_1 = Suitability Index (SI) of tree density.

I_2 = SI of height of lowest overstory trees.

I_3 = SI of percent herbaceous canopy cover.

I_4 = SI of distance to opening.

I_5 = SI of distance to scrubland.

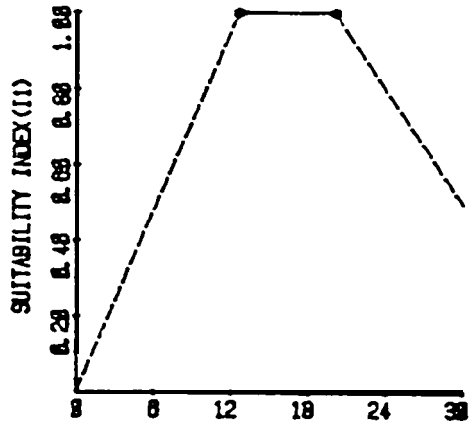
I_6 = SI of distance to conifer tangles or thickets.

I_7 = SI of presence of preferred winter foods.

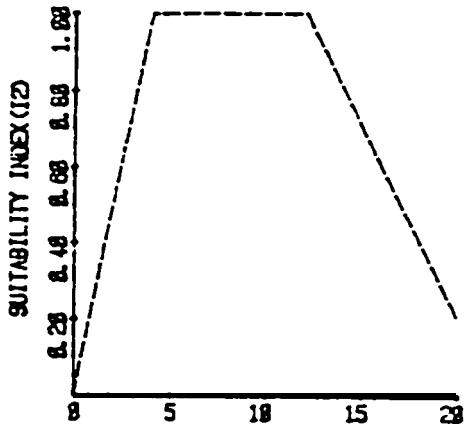
The Habitat Suitability Index is the lowest X_n value.

RUFFED GROUSE

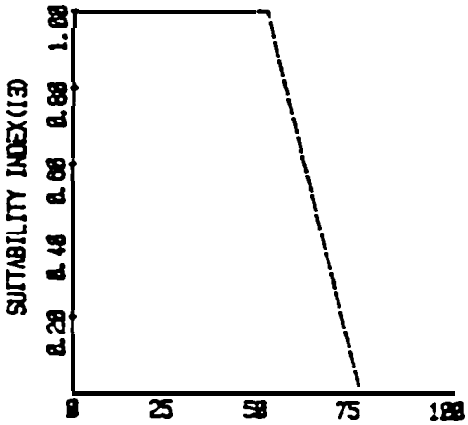
TREE-DOMINATED WETLAND



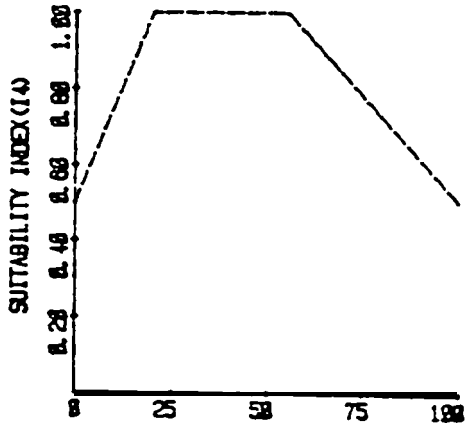
TREE DENSITY (THOUSANDS/HA)



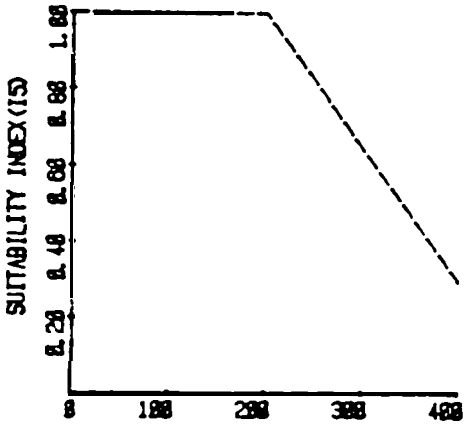
HEIGHT OF LOWEST OVERSTORY TREES
00



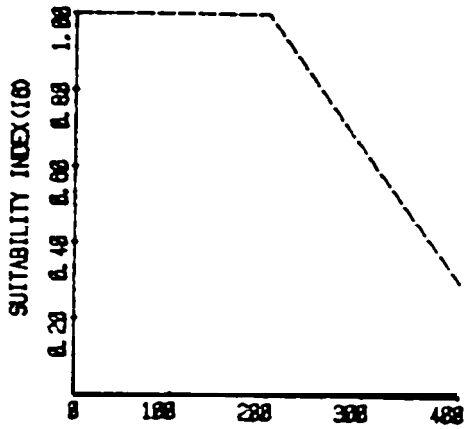
HERBACEOUS CANOPY COVER (%)



DISTANCE TO OPENING 00



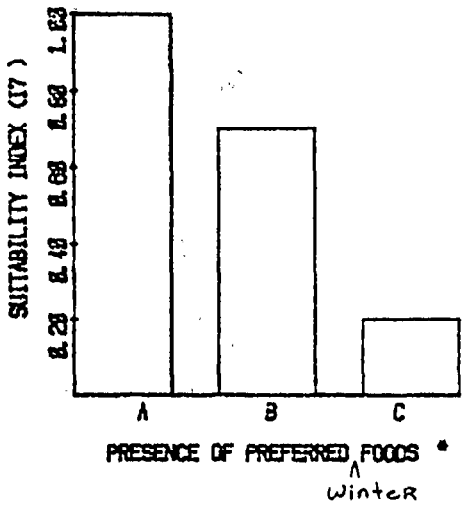
DISTANCE TO SCRUBLAND 00



DISTANCE TO CONIFER TANGLES OR
THICKETS 00

RUFFED GROUSE

TREE-DOMINATED WETLAND



A. 3 TO 4 PREFERRED FOODS PRESENT
B. 1 TO 2 PREFERRED FOODS PRESENT
C. NO PREFERRED FOODS PRESENT

* REFER TO TEXT FOR PREFERRED WINTER FOODS

SPRUCE GROUSE MODEL

HA8 ITAT SU ITAB IL ITY INDEX

Spruce Grouse In Coniferous Forest

Food Value (Spring/Summer/Fall) $(X_1) = I_1$

Where: I_1 = Suitabil ity Index of % cover of berry-producing plants

Winter Range Value $(X_2) = (I_2 \times I_4)^{1/2}$

Where: I_2 = SI of % spruce in stand composition

I_4 = SI of % tree canopy cover

Cover Value $(X_3) = (I_2 \times I_4 \times I_5 \times I_6)^{1/4}$

Where: I_2 = SI of % spruce in stand composition

I_4 = SI of % tree canopy cover

I_5 = SI of % shrub and sapl ing crown cover (>3 feet)

I_6 = SI of % herbaceous and woody ground cover (<3 feet)

Reproductive Value $(X_4) = (I_7 \times I_8 \times I_9)^{1/3}$

Where: I_7 = SI of average size of openings among tree trunks (feet)

I_8 = SI of height of majority of trees (feet)

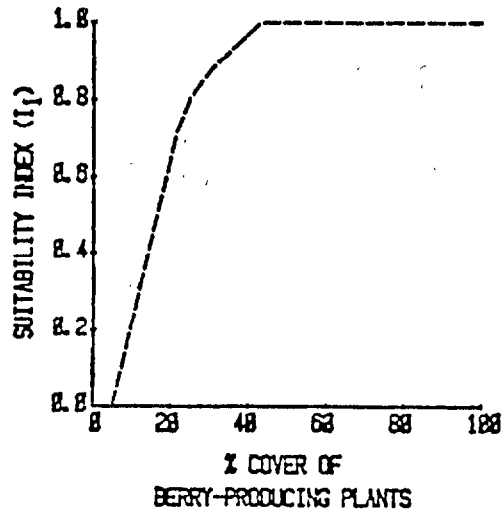
I_9 = SI of average hei ght of ground vegetation In openi ngs at least 15 feet w ide (feet)

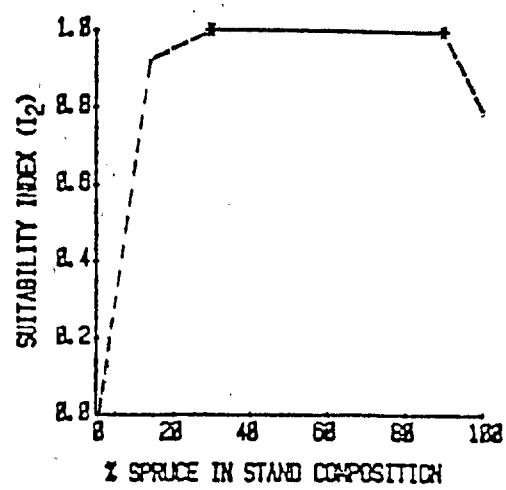
The Habitat Suitabil ity Index Is the lowest X_n value.

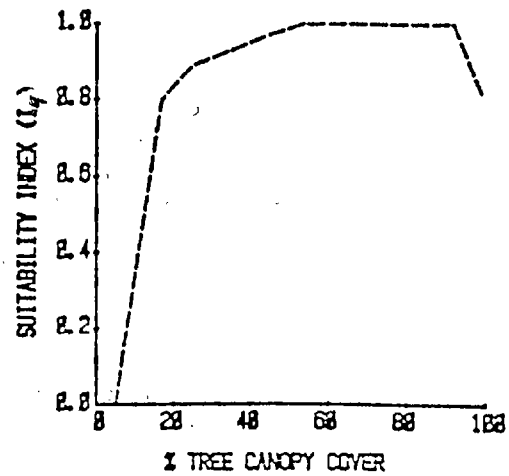
SPRUCE GROUSE

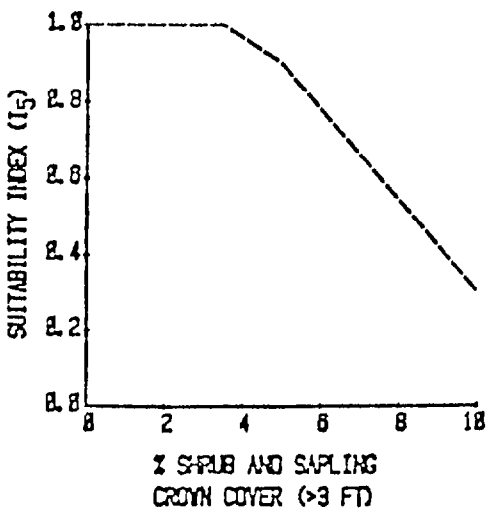
REVIEW COPY

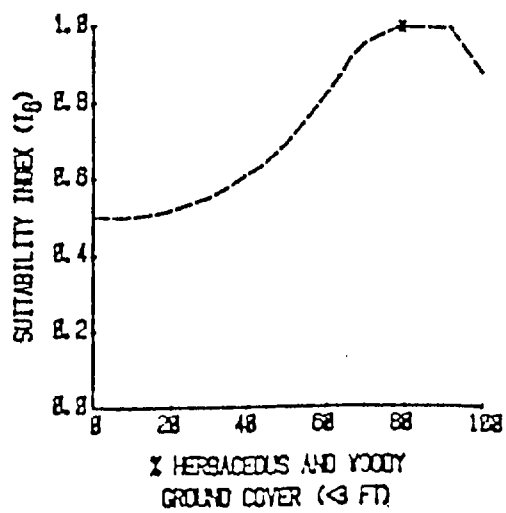
CONIFEROUS FOREST







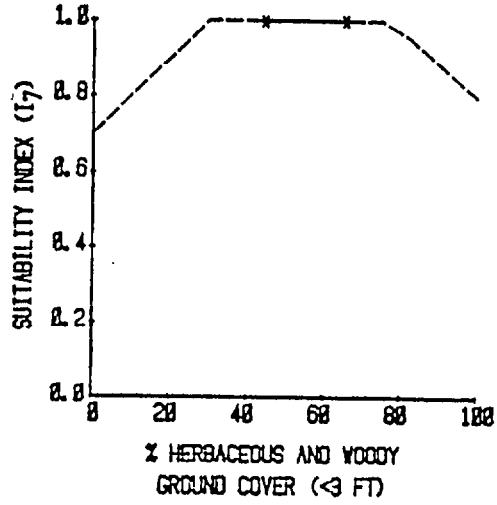


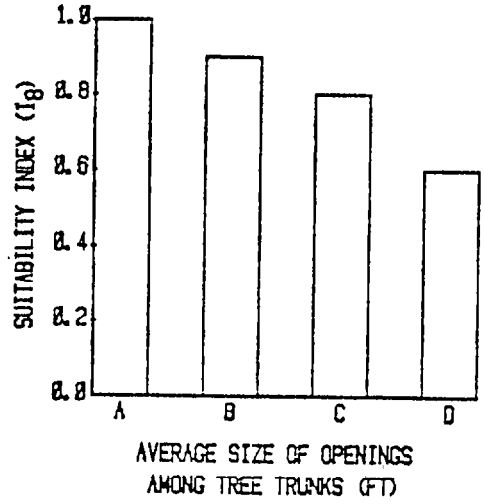


SPRUCE GROUSE

REVIEW COPY

MIXED CONIFEROUS ~~DECIDUOUS~~ FOREST



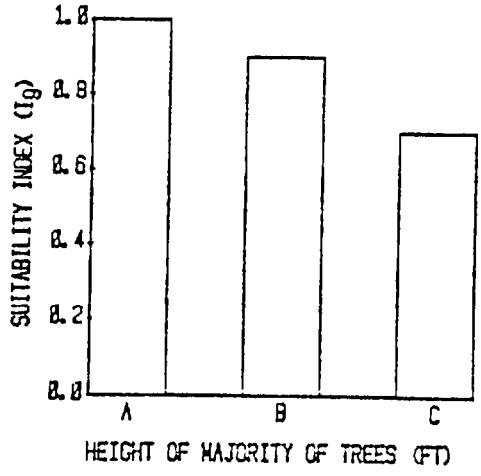


A - OPENINGS 21-30 FEET ACROSS

B - OPENINGS 31-40 FEET ACROSS

C - OPENINGS 15-20 FEET ACROSS

D - OPENINGS <15 OR >40 FEET ACROSS



A - TREES >30 FEET HIGH

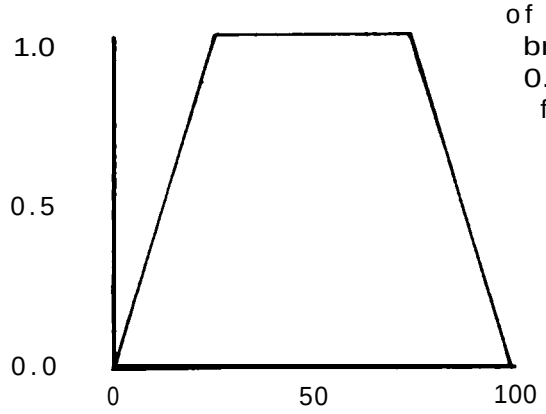
B - TREES 20-30 FEET HIGH

C - TREES <20 FEET HIGH

YELLOW-RUMPED WARBLER

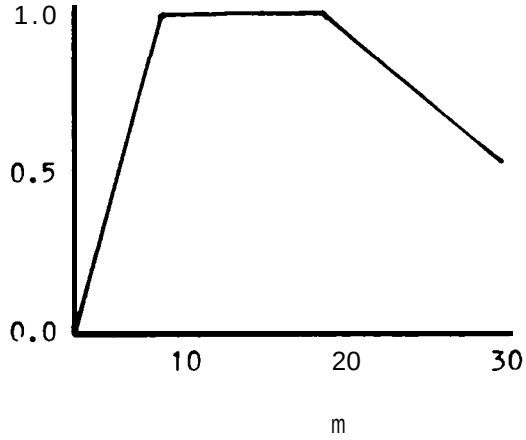
Evergreen Forest

1. Percent canopy closure = measured on an area the size of a yellow-rumped warbler's breeding territory (given as 0.8 ha, 2.0 acres until data from the Pacific Northwest are available)



Assumes:
- Open conifer forests (canopy closure of 25 to 75%) are optlmal for nestlng and foraging (Bent 1953)

2. Average tree height = measured on an area, the size of this warbler's breeding territory (approximately 0.8 ha, 2.0 acres)



Assumes :
- Foraging and nesting usually occur at heights of 3 to 9 m (Bent 1953; Morse 1970, 1971)
- These activities occur in the lower portions of conifer trees.

HSI = $(V_1 * V_2)^{1/2}$

Appendix B:

Pre-project cover type maps for Anderson Ranch, Black Canyon, and Boise Diversion projects (Not to exact scale, for display only).

Plates A-l through A-8: Anderson Ranch. (Approximate scale 1: 13,900)

Plates B-l through B-2: Black Canyon. (Approximate scale 1:28,935)

Plate C: Deadwood. (Approximate scale 1:31,250)

Plate D: Boise Diversion. (Approximate scale 1: 16,080)

LEGEND

Shrub-Steppe

Deciduous Forested Wetland

Evergreen Forest

Deciduous Scrub-Shrub Wetland

Agriculture/Pasture

Riverine

Deciduous Shrubland

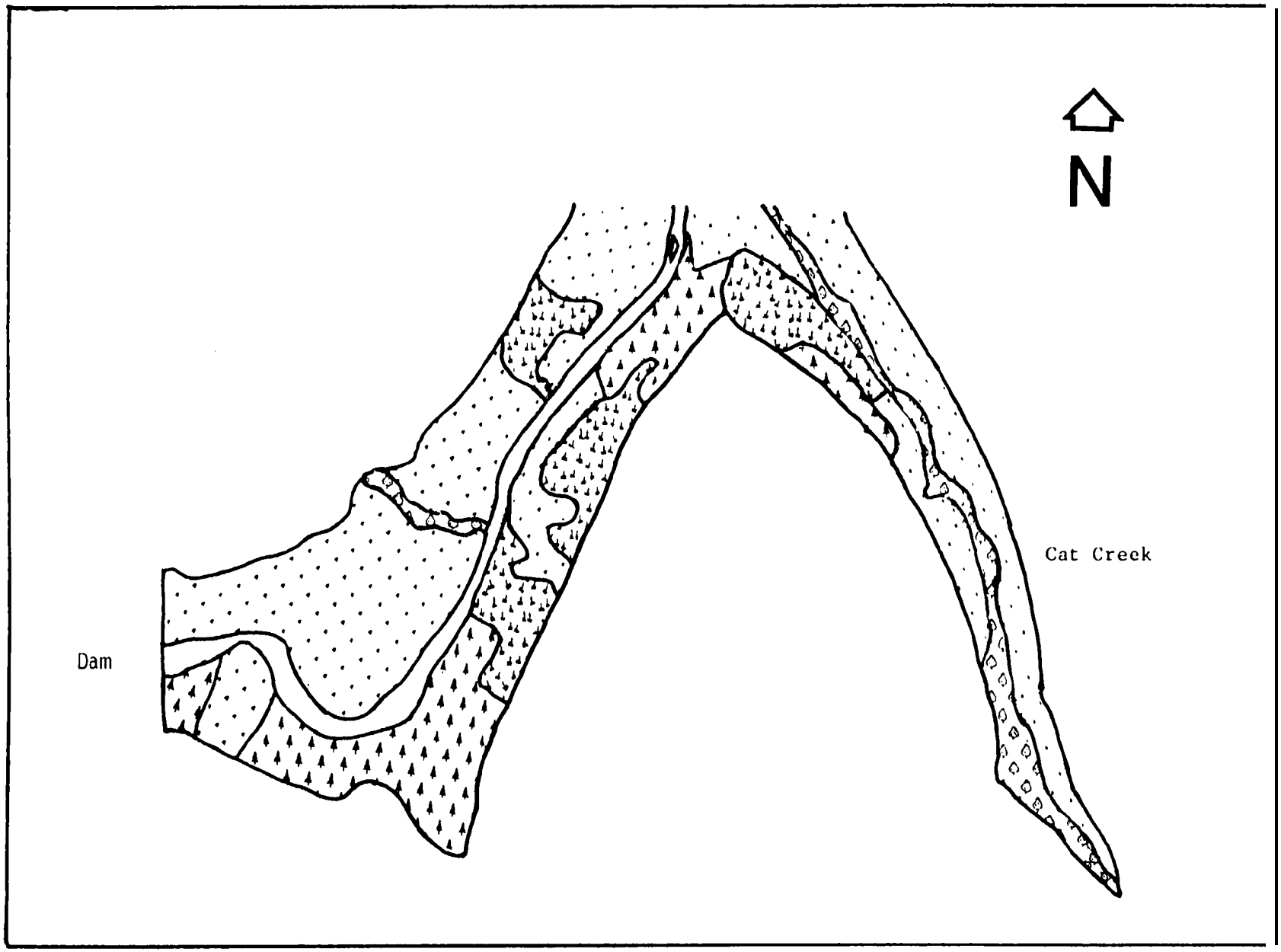


Plate A-1 Anderson Ranch

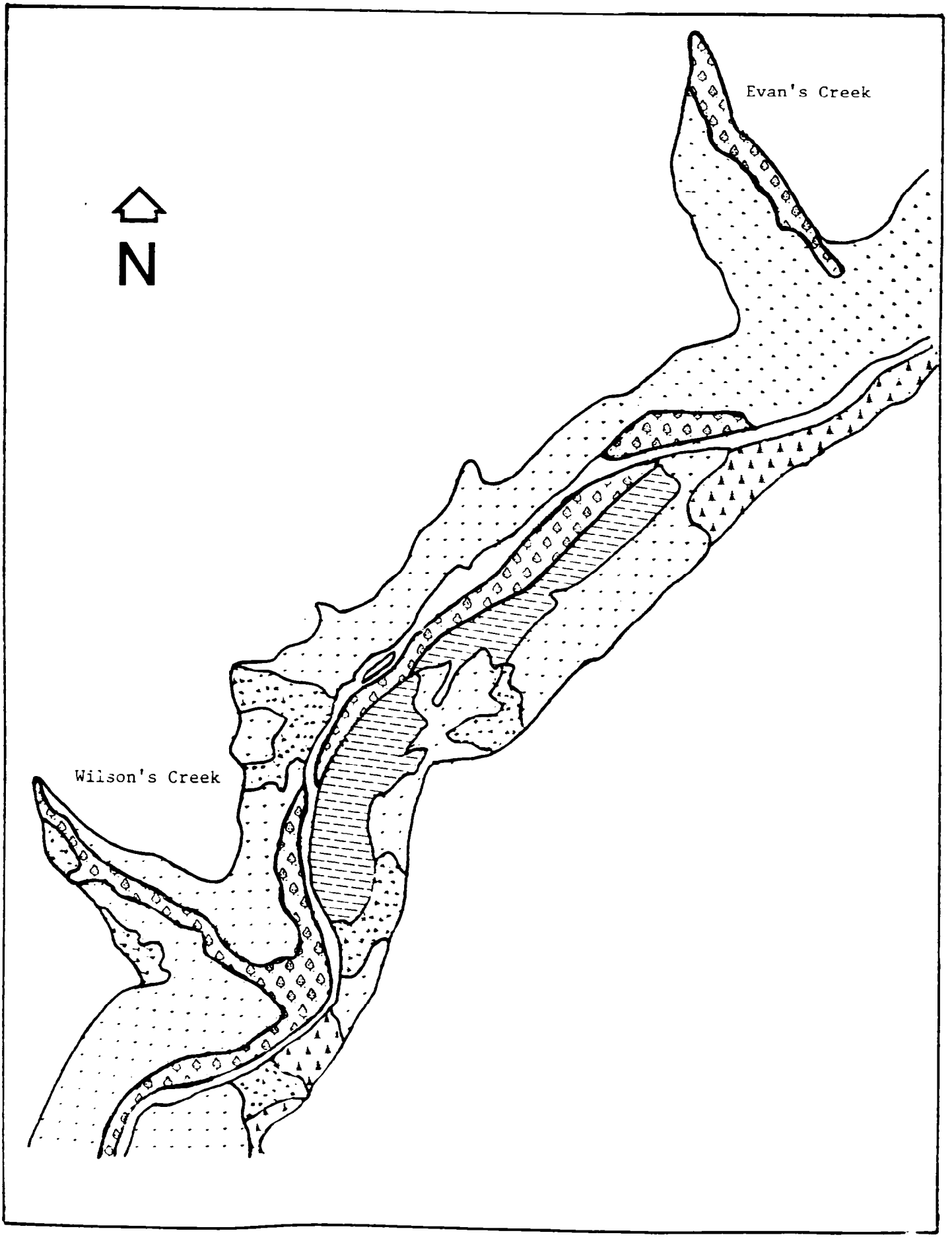
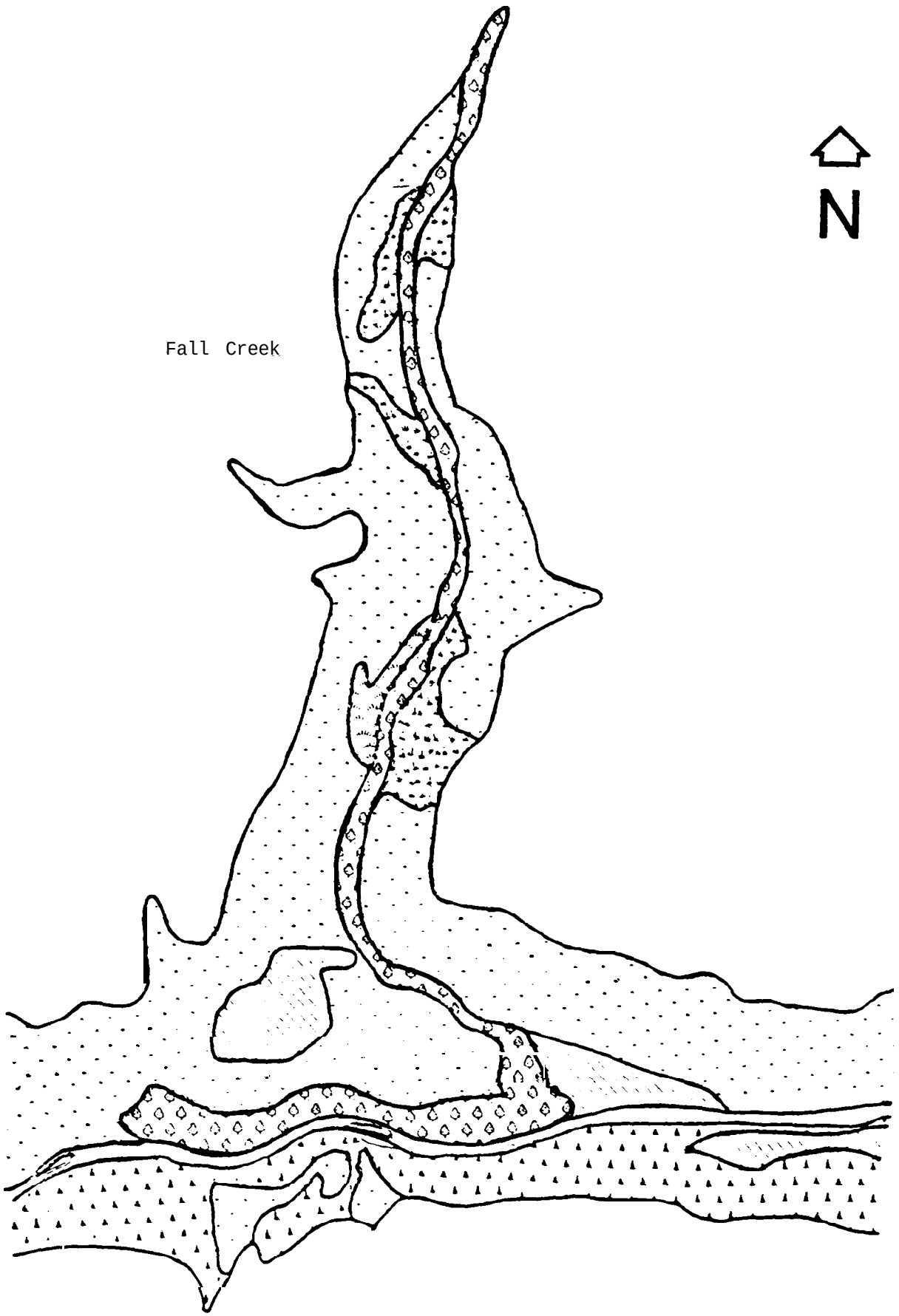


Plate A-2. Anderson Ranch


N
Fall Creek

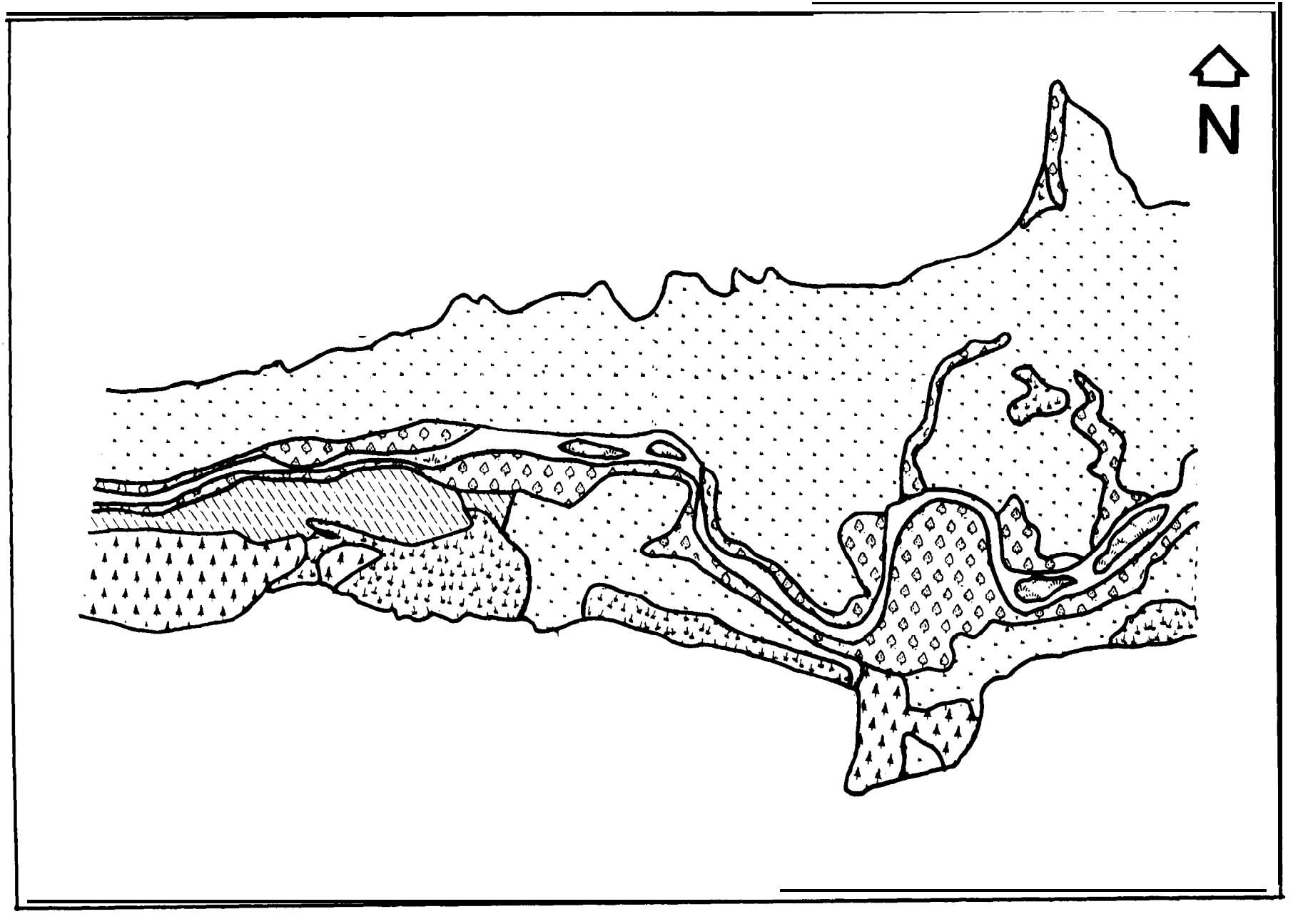


Plate A-4. Anderson Ranch

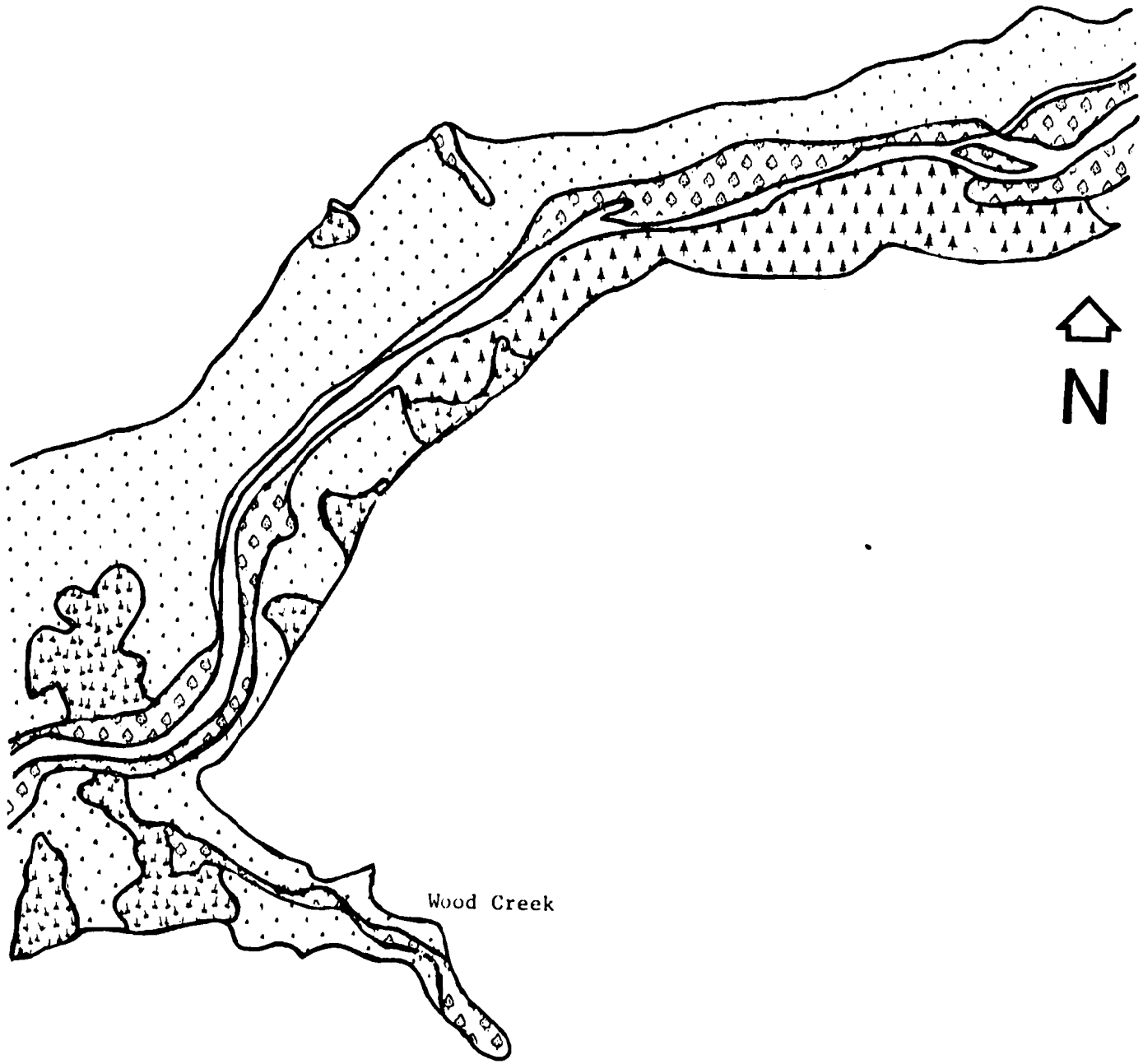


Plate A-5 . Anderson Ranch

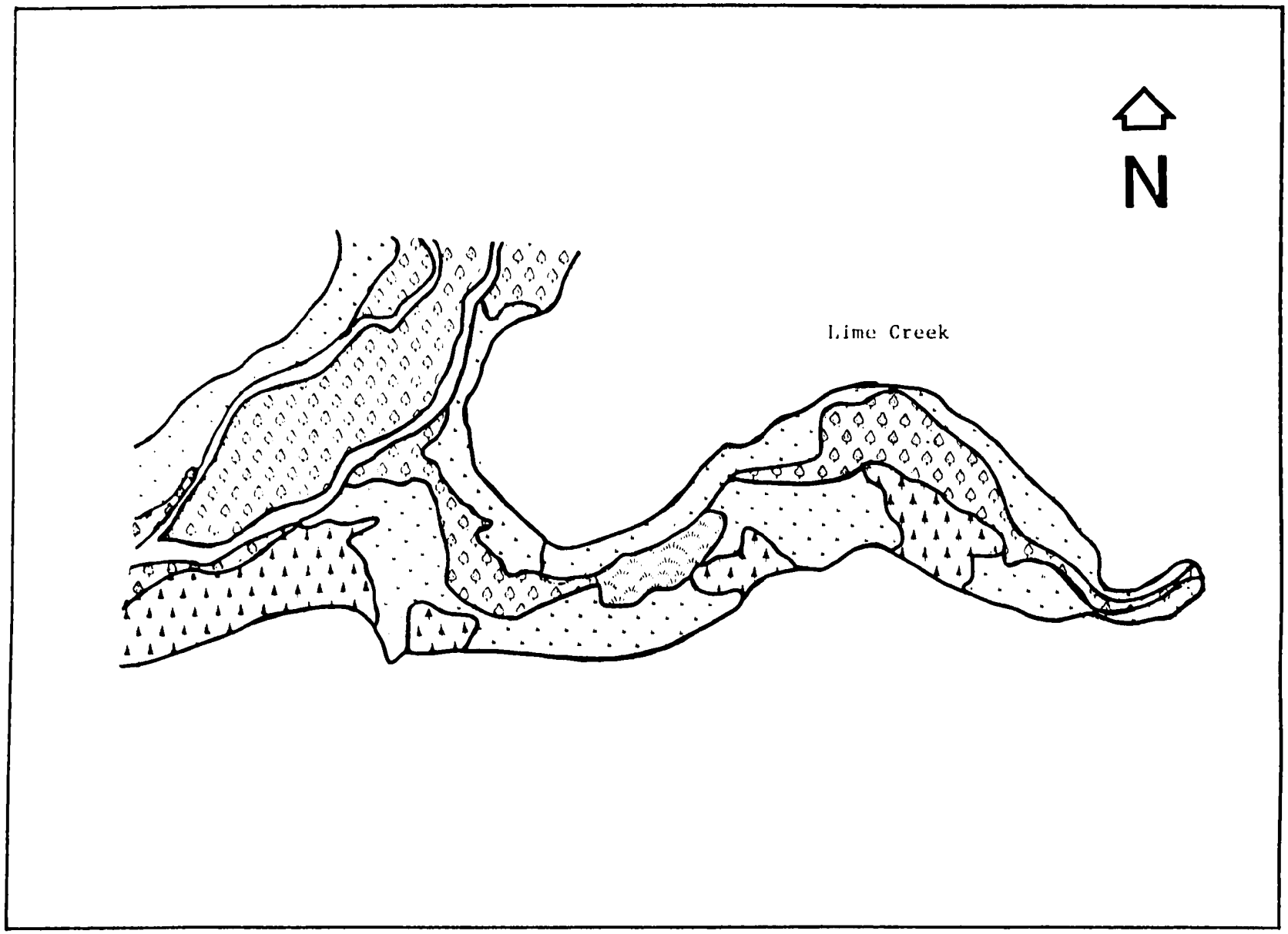


Plate A-6 . Anderson Ranch

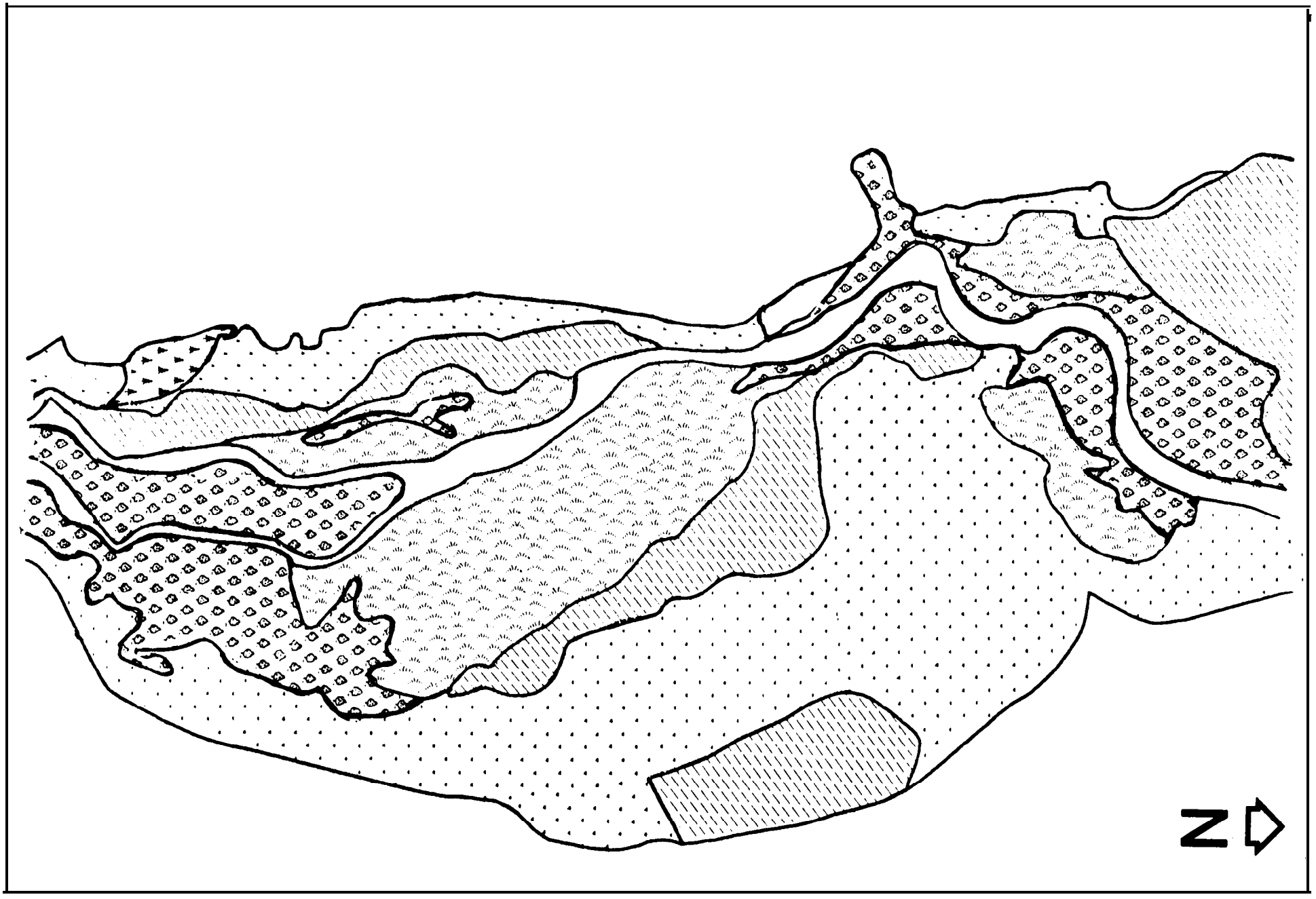


Plate A-7. Anderson Ranch

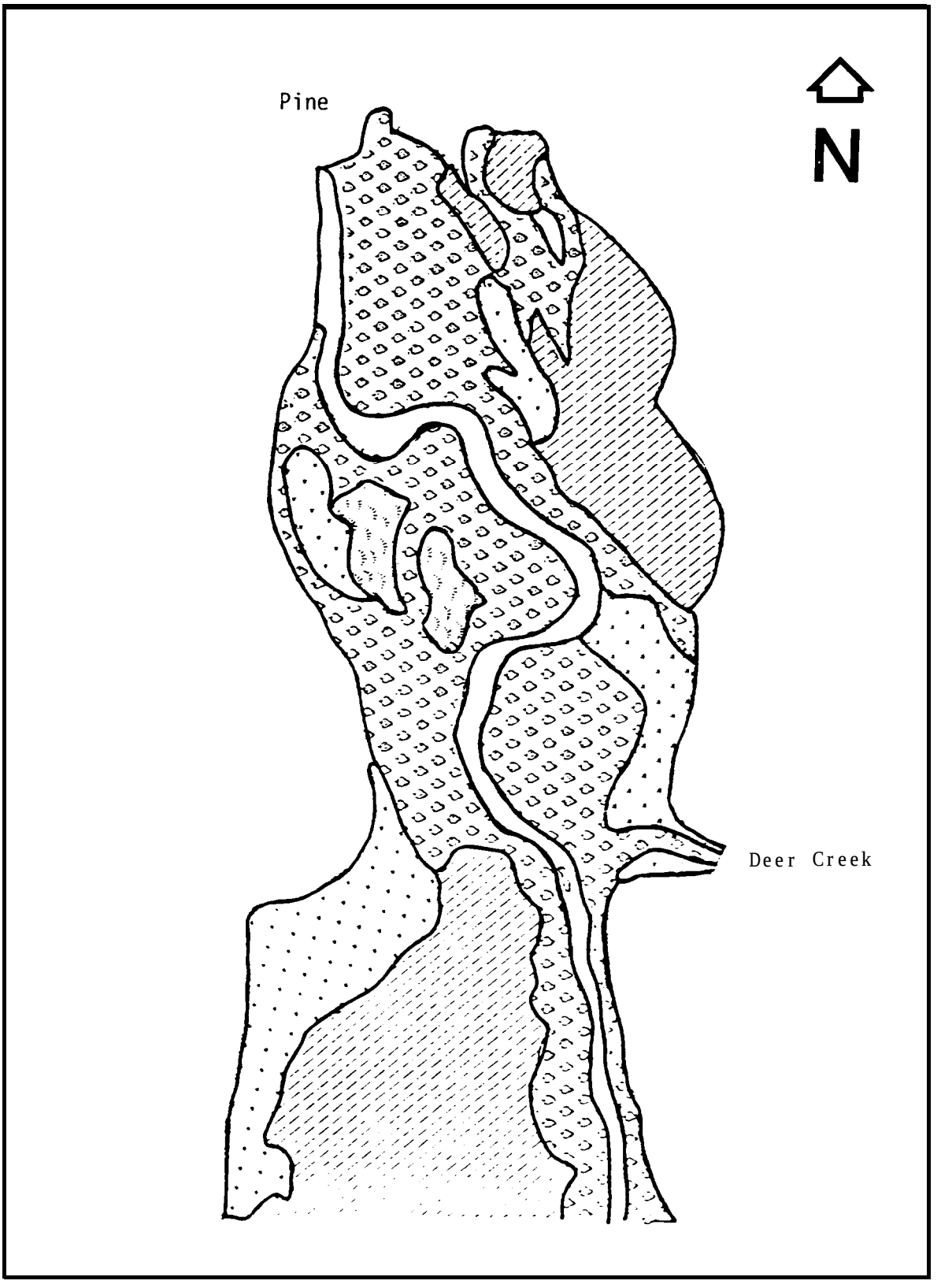


Plate A-8. Anderson Ranch

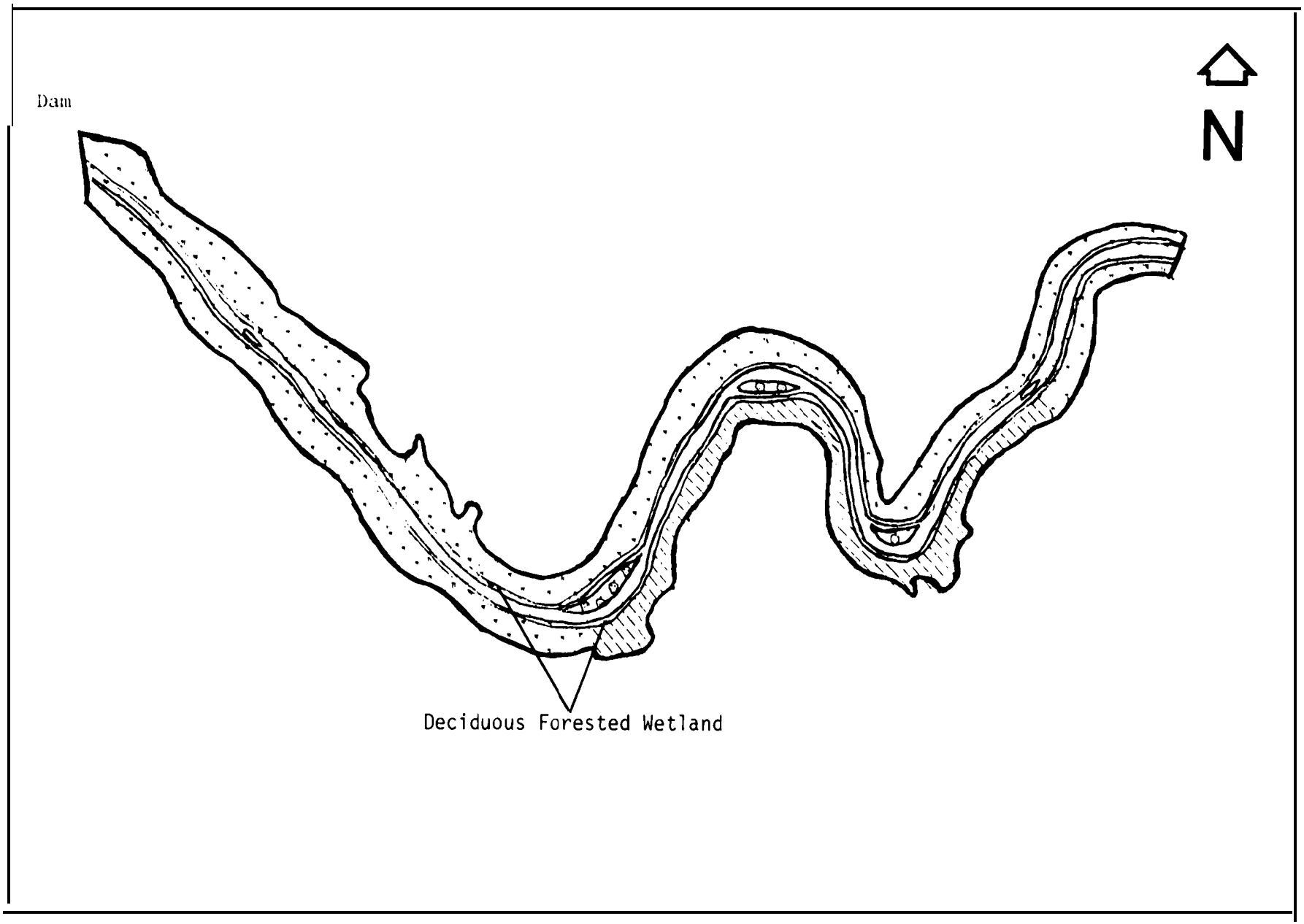


Plate B-1. Black Canyon

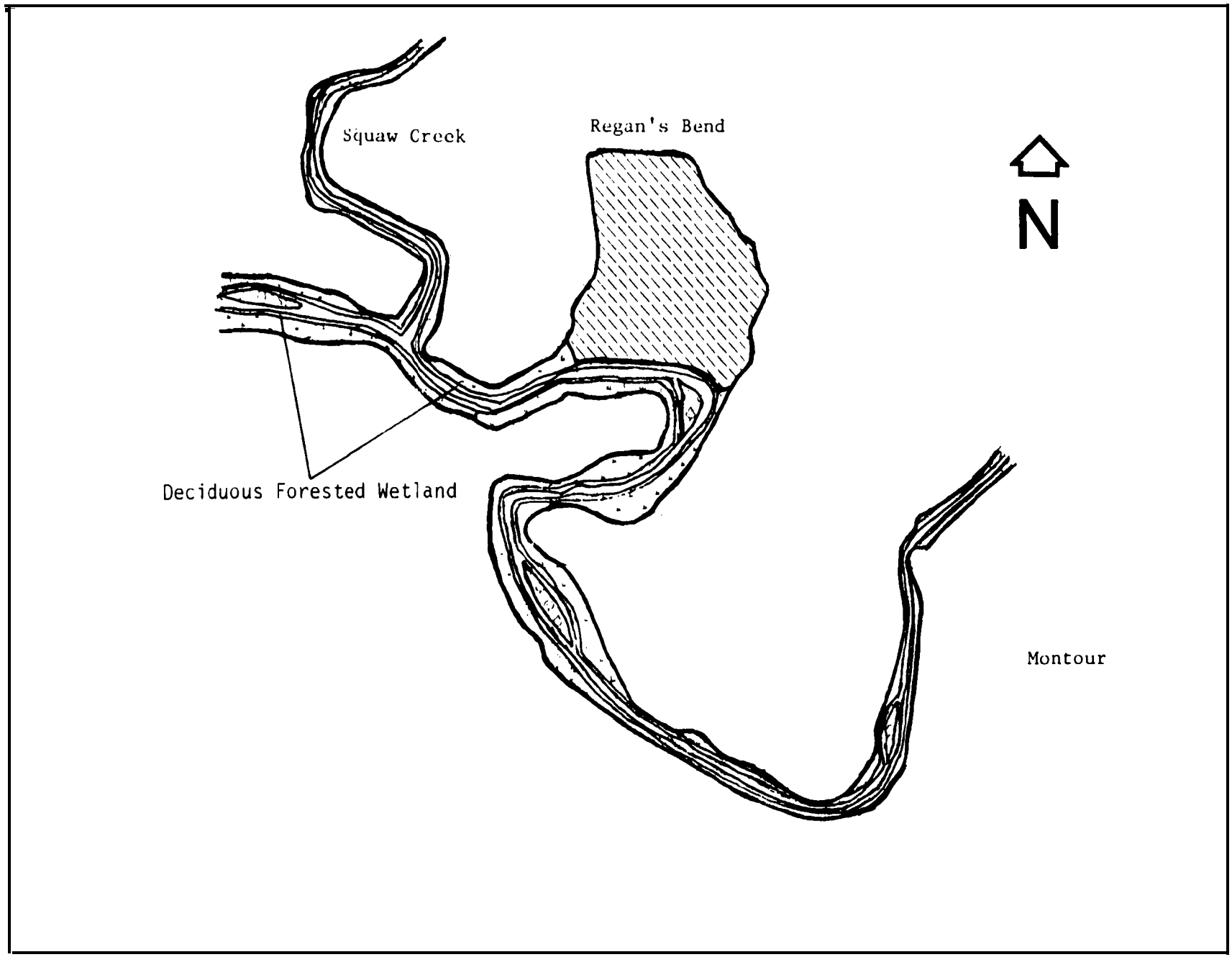


Plate B-2. Black Canyon

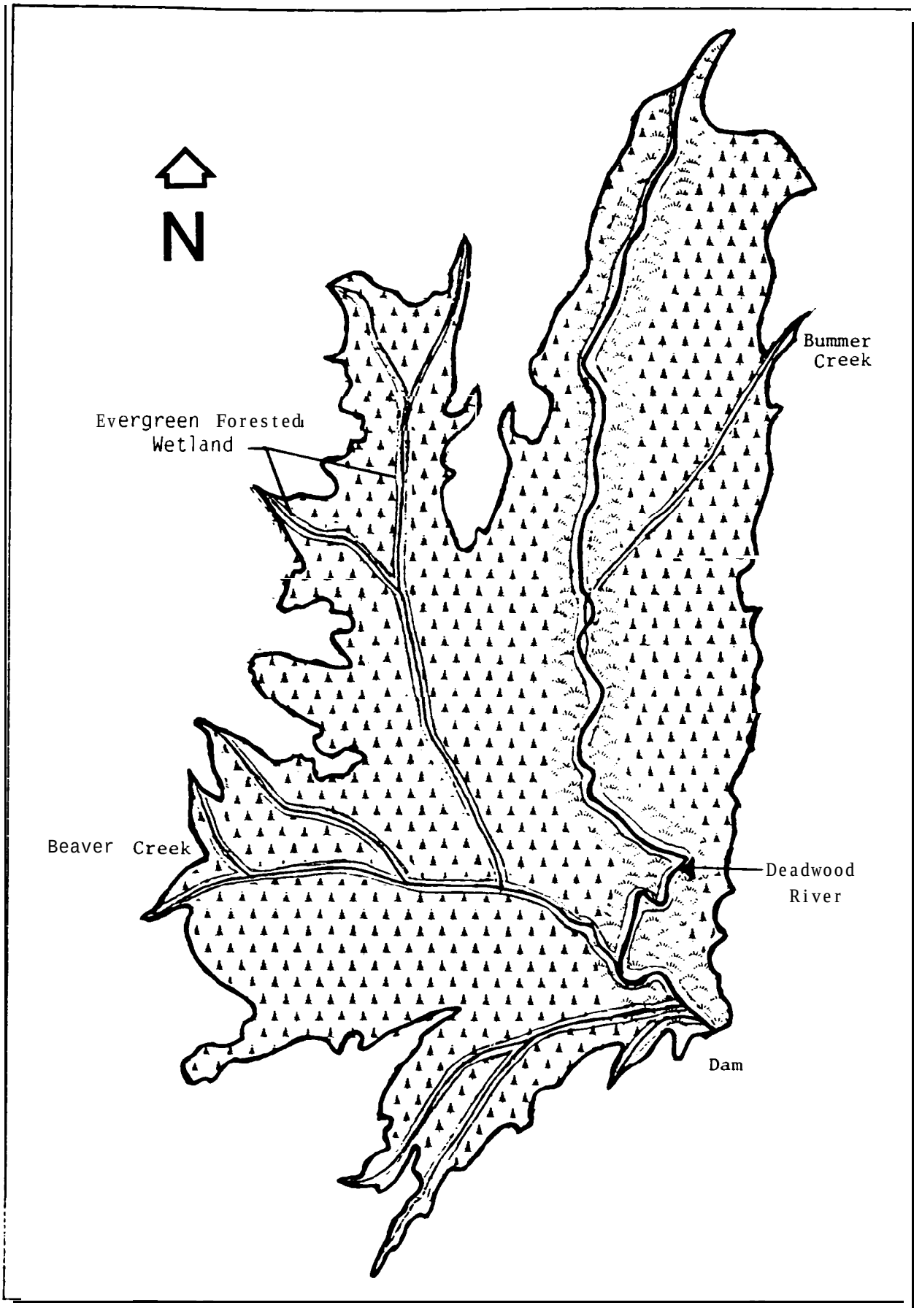


Plate C. Deadwood

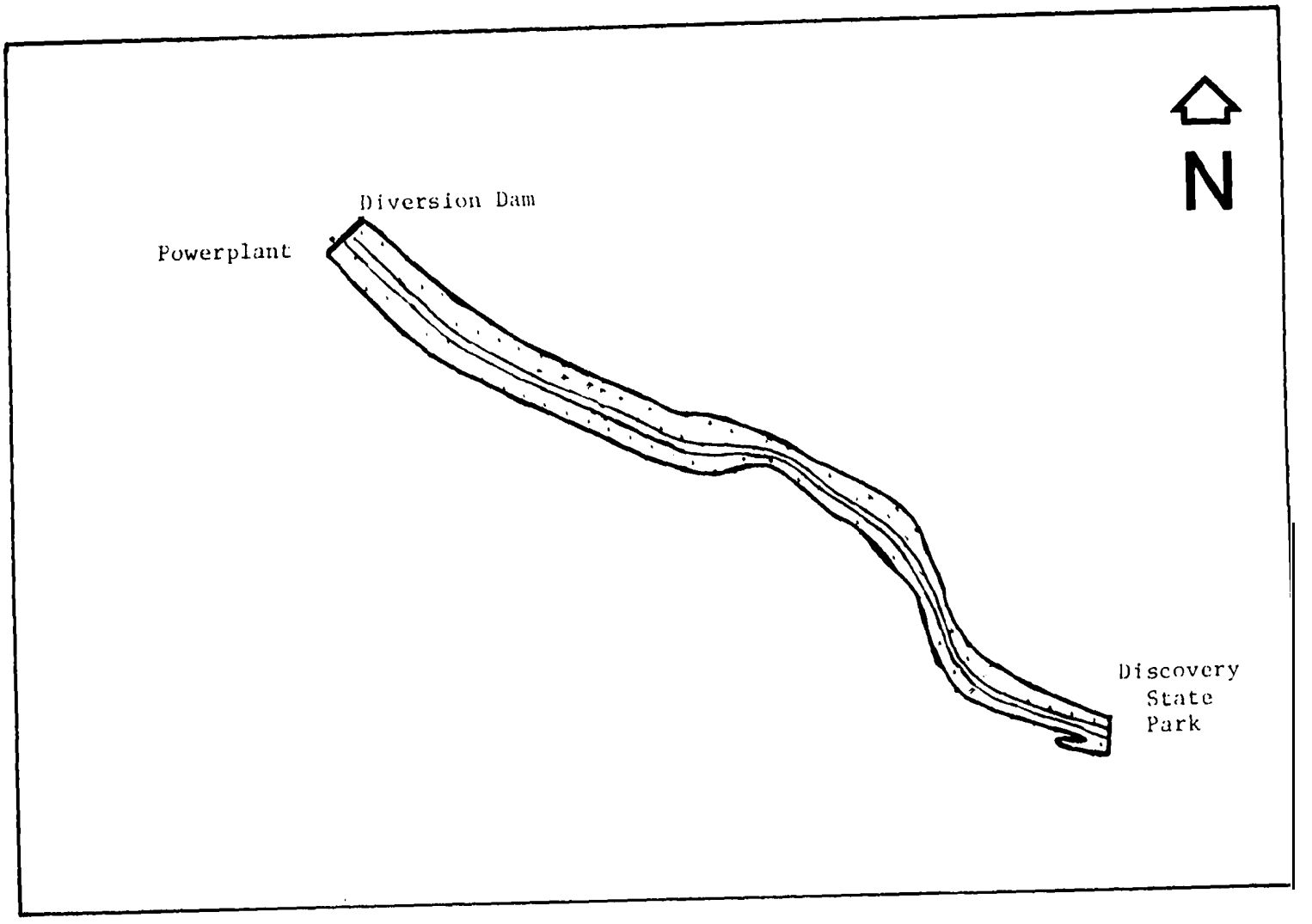


Plate D Boise Diversion

Appendix C:

Ecology of evaluation species, osprey, and bald eagle.

Mule deer
Mink
Mallard
Canada goose
Blue grouse
Ruffed grouse
Ring-necked pheasant
Spruce grouse
Bald eagle
Osprey
Black-capped chickadee
Yellow warbler
Yel I ow-rumped warbler

Mule Deer Ecology

Mul e deer are herbivores and consume primarily herbs and smal l shrubs (Hil l 1956). Some plants may be eaten i n one area and not another, or only in certain seasons or stages of growth (Mackie et al. 1982). Analysis of data from 99 food habits studies of mule deer In the Rocky Mountai ns reveal s that the diet is comprised of at l east 202 shrub and tree species, 484 forbs, and 84 grasses, sedges, and rushes (Kufel d et al. 1973).

Common year-round forage speci es i ncl ude sagebrush and mahogany species, bitterbrush, maple, juniper, and pachystima. Spring diets contai n the highest percentage of grasses, and mul e deer general ly fol low the spring green-up of grasses. In summer, forbs reach peak use while grass use decl ines. The fall represents a transition to shrubby vegetatlon. Forbs are still a large part of the diet, and leaf fall generally promotes use of hardwood foliage. Browse species dominate the winter diet.

Seasonal temperature and moisture regimes regul ate the nutritional cycle of mule deer (Wallmo 1978). Diets may fall to meet energy requi rements for body mai ntenance, with winter browse being the most limiting factor (Wal lmo et al. 1977). Some of the more important factors governing a rangers potential to support deer incl ude snow condi tions duration of winter, and time of initiation of spring growth (Schneegas and Bumstead 1977).

Mul e deer inhabit every majo vegetation type in temperate western North America (Mackie et al. 1982). They are general ly migratory, inhabiting higher elevations in sunmer, and decending to lower areas in winter (Gilbert et al. 1970). Mountain and al pine forests usually dominate summer ranges, while open, shrub-covered sl opes and ridges dominate winter ranges (Mackie et al. 1982).

Winter is the critical time of the year for big game. Forage qual ity and quantity limits the amount of accessible range (Gil bert et al. 1970). In Colorado, distribution on winter range was primaarily a function of snow depth, and depths exceeding 18 inches essential ly precl uded deer use. Extreme snow depths inhibit use of higher elevations forcing mule deer to concentrate, often at higher densities, on south-facing slopes where snow depths are less and food sources are accessible (Mackie et al. 1982). The time and extent of concentration depends on the time, rate, and amount of snow accumulation throughout the mountainous regions.

Winter range In Utah has been characterized as having 32% vegetative ground cover with 58% of the ground cover consisting of preferred browse species (Richens 1967). Vegetation use Is generally more intense near escape cover and more accessible areas along streams and trails. Browsing occurs on all slopes, but occurs more of ten on drier, southern slopes. In Colorado, excellent winter range is characterized as areas where surface acreage is approximately one-half shrub types and one-half timbered types. Mule deer preferred south and east facing slopes (Loveless 1967). Loveless (1963) also observed that proximity of browse-covered slopes to sites dominated by timber, with a browse understory, had a positive effect on distributional patterns of mule deer.

Prime sunmer range typically occurs in areas with relatively high rainfall that supports a diversity of vegetation located on a variety of topographic aspects (Schneegas and Bumstead 1977). Summer range capable of carrying deer In good condition through the winter is necessary for maximum herd productivity (Julander et al. 1961). In order to maintain body conditions adequate forage quality and quantity must be available to build adequate storage reserves (Hill 1956). Sumner range generally Is not limiting, but may be critical in areas of isolated plateaus on mountains surrounded by arid lowlands (Julander et al. 1961).

Regardless of where the sunmer range Is located, mule deer return to ancestral wintering areas to which they were first taken as fawns (Zalunardo 1965). Mule deer may move 80 km (50 miles) or more from summer to winter range (Wallmo 1978), and the movement Is generally in response to snowstorms and cold weather In early to mid-November (Richens 1967).

Within any broad habitat or area, mule deer usually occupy a variety of different cover types or local vegetation-topographic complexes (Mackie et al. 1982). The species requires plant diversity for food. Therefore, several individual vegetation types may be used throughout the course of a year. A variety of vegetation types may also be needed for hiding, escape, and thermal cover.

Many factors influence mule deer populations. Habitat and nutritional limitations are probably the most Important. Winter range is one of the most critical components of mule deer habitat (Thomas et al. 1976), and any adverse environmental impacts to these areas are generally magnified in deer populations. Other potentially limiting factors include weather, parasites, diseases, predation, and competition with other wild and domestic animals (Mackie et al. 1982, Richins 1967).

Mink Ecology

Mink are predaceous, semi-aquatic mammals associated with stream and river banks, lake shores, fresh and salt water marshes, and marine shorelines (Gerell 1970). The species is mostly nocturnal and remains active throughout the year (Linscombe et al. 1978). Mink are adaptable in their habitat use and are opportunistic feeders.

Mink will generally use aquatic habitats and riparian and upland habitats within 200 meters of the water's edge (Melquist et al. 1981). Habitats associated with small streams are preferred to those with large, broad rivers, and wetlands with irregular and diverse shoreline provide more suitable habitat than do those with straight open and exposed shorelines (Allen 1984). In west-central Idaho, high mink densities were attributed to well-developed riparian zones and consequent abundance and diversity of prey (Whiteman 1981). Mink commonly use streams with abundant downfall or debris providing foraging and security cover, and avoid open water (Melquist et al. 1981).

Mink use a variety of prey species which varies with season, prey availability, and habitat type (Melquist et al. 1981). Relative amounts of each prey item taken closely parallels the abundance of each species present (Eberhardt and Sargent 1977). In Idaho, fish, waterfowl, and small mammals were important prey. Fish comprised 59% of the mink diet, and species consumed were suckers (*Catostomus* spp.), mottled sculpin (*Cottus bairdi*), squawfish (*Ptychocheilus* spp.), and salmon (*Salmo* spp.). Small mammals comprised 43% of the diet, and species consumed included jumping mice (*Zapus* spp.), deer mouse (*Peromyscus maniculatus*), muskrat (*Ondatra zibethicus*), snowshoe hare (*Lepus americanus*), pika (*Ochotona princeps*), yellowpine chipmunk (*Tamias amoenus*), and shrews (*Sorex* spp.) (Melquist et al. 1981) Waterfowl were important in the spring and early summer diet when young ducks were abundant. Mink also consume reptiles and invertebrates when available.

Mallard Ecology

The mallard is the most common breeding and wintering duck in the northern hemisphere (Bellrose 1976). In the Pacific flyway, large numbers of mallards occur in the Columbia and Snake River basins (Chatten 1964).

Breeding populations of mallards depend on the number of available wetlands for nesting (Prospahala et al. 1974). Nests are generally located in herbaceous vegetation averaging 24 inches high and close to water. Most nests are within 100 yards of water (Bellrose 1976).

Mallard food habits are highly adaptable. Their diet is 90% vegetation and consists of primarily marsh and aquatic plants (McAtee 1918). Plants consumed include sedges (*Carex* spp.), wild rice (*Zizania aquatica*), smartweeds (*Polygonum* spp.), pondweeds (*Potamogeton* spp.), duckweeds (*Lemna* spp.) (McAtee 1918), wild celery seed (*Vallisneria spiralis*), wild millets (*Echinochloa* spp.), naids (*Naja* spp.), burreeds (*Sparganium* spp.), and other species (Martin et al. 1951). In the Columbia Basin of Washington, mallards consumed seeds of wildmillet, beaked sedge (*Carex rostrata*), and reed canarygrass (*Phalaris* spp.) (Yocum 1957); and in California, pondweed, spike rush (*Eleocharis* spp.) bullrush (*Scirpus* spp.), sedge seeds, and eel grass (*Zostera* spp.) were important foods (Bellrose 1976).

Grain crops consumed by mallards include sorghum, barley, and wheat (Martin et al. 1951). Juveniles less than three weeks old consume an abundance of animal matter (Yocum 1957).

The presence of shallow water feeding areas is a critical factor for mallards (Johnsgard 1975). Food may be taken from the surface or just below the surface of water, and on the ground. Shallow water feeding areas include sloughs, ponds, marshes, streams, and swamps.

Factors limiting mallard populations include hunter-caused mortality and nest failure. Hunting mortality replaces some natural losses but, in general, hunters kill more ducks than the mortality that would occur without hunting (Hickey 1952). Causes of nest failure are predation and desertion. Predators include coyotes, skunks, crows, magpies, ground squirrels, foxes, and California gulls. Desertion is generally caused by predators (Bellrose 1976).

Canada Goose Ecology

In the Intermountal n region, the Snake River drainage is an important breeding and wintering area for Canada geese. Approximately 12,000 birds w inter along the Snake River (Bel l rose 1976).

Geese often nest on islands. Islands may be located in natural lakes, reservoirs, rivers, or streams. Standard nest site characteristics include proximity to water, nesting cover (Bellrose 1976), and an exposed v iew for the incubati ng bird (Hansen and Browning 1959). Most nests are located within a few feet of water and 90% of all nests are w ith in 50 yards of water (Bel l rose 1976).

Canada geese consume both native and cultivated plants. Geese browse on l eaves of cl over and gasses, as wel l as roots, stems, and seeds of rushes and bul l rushes. More than any other waterfowl species, Canada geese have benef ited f ran the agricul tural products of man. Referred grains Include mil l et, corn, oats, buckwheat, grai n sorghums, and soybeans (Bel l rose 1976).

Nest failure and hunting are the two major factors l imiting Canada geese popul ations. Leading causes of nest failure are desertion, destruction by predators, and destruction by other natural agents. In 17 studies, 42% of nests were deserted, 48.2% were destroyed by predators, and 9.2% were destroyed by other factors (mostly flooding). Major predators are skunks, coyotes, crows, magpies, and ravens. Major causes of desertion are predators, human activ ity, and Intraspeclf ic strife (Bel l rose 1976).

Blue Grouse Ecology

Blue grouse are associated with coniferous forests of western America. Their distribution closely parallels distribution patterns of true fir (Abies spp.) and Douglas-fir (Psuedotsuga menziesii) (Johnsgard 1983).

Blue grouse generally follow a bimodel pattern of habitat use. They winter on high fir-covered mountain slopes or ridges, and prefer areas with Douglas-fir present. In the spring, they migrate to lower elevations and use open, brushy habitats to breed, nest, and raise their young (Marshall 1946, Weber et al. 1974). In the fall, the movement is reversed, and they migrate back to the conlferous forests.

Spring habitat includes areas needed for breeding, nesting, and brood-rearing. Breeding males prefer open habitats over dense habitats (Bendell and Elliott 1966). Structural features appear more important than plant species composition for breeding habitat selection (Schroeder 1984). Common features of breeding territories Include sane type of tree cover, shrub thickets, open areas, openess in the canopy, and understory vegetation. In Idaho, birds occupied vegetation types with 40-70% tall shrubs and trees, and areas with approximately 50% tree cover had more grouse than areas with less tree cover (Stauffer and Peterson 1985b). Most nests are located near breeding territories (Weber 1975), and are on the ground under, or next to, shrubs or logs (Johnsgard 1983).

Brood-rearing habitat for blue grouse appears to be that which provides ample opportunities for young to feed on insects and other invertebrates (Johnsgard 1983). The most important characteristics of brooding areas are proximity to cover and an extensive herbaceous layer (Donaldson and Bergerud 1974). In southeastern Idaho, broods occupied areas with greater than 50% herbaceous cover that was at least 50 cm tall (Stauffer and Peterson 1985b).

Blue grouse consume primarily vegetation. In Washington and northern Idaho, 98% of adult blue grouse year-round diet consisted of plant matter. The majority of plant matter was conifer needles (63%), followed by berries (17%), miscellaneous plants (17%), and animal matter (2%). Young chicks almost exclusively eat invertebrates the first 10 days of life; by mid-August, their diet becomes the same as adults (Beer 1943).

Seasonal shifts occur In the blue grouse diet. True fir and Douglas-fir needles prwide the bulk of the winter diet; and berries, primarily blackberries (Rubus spp.), currants (Ribes spp.), and bearberry (Arctostaphylos uva-ursi) prwide most of the sunmer diet (Beer 1943).

Ruf fed Grouse Ecol ogy

Ruffed grouse inhabit early successional deciduous communitles and prefer sites dominated by quaking aspen (Populus tremuloides) (Berner and Gysel 1969, Stauffer and Petersen 1985a). Gul l lan et al. (1962) and Gul l ian (1970) considered the presence of aspen to be critical in maintaining viable ruffed grouse populations. In the Pacific Northwest, ruffed grouse are typically found in lowlands and river bottoms, in ecotones between forests and clearings, and in brush tangl es In burned or l ogged areas (Jackman and Scott 1975). In Idaho, they also use aspen stands year-round (Stauffer and Peterson 1985b).

Spring habitat use for males is closely tied to suitable drumming sites or activity centers (Gul l lan and Marshal l 1968). Two factors gwerning drumming sites are the presence of 40- to 50-year-ol d aspens near or within sight of a drumming log, and traditional use of a site by male grouse. Boag and Sumanik (1969) found mal es sel ect drumming sites that have sufficient openings in the shrub layer to see at least 20 yards in al l directions, suf f iclent height above ground to observe other grouse or large ground predators, and suff lclent canopy and stem coverage to screen b i rds f ran aer i al predators.

Nest sites are general ly at the base of trees, and surrounding understory canopy cover is relativel y open (Edminster 1947). Most sites are generally chosen to provide a combination of visibil lty, protect ion, escape routes, and proximity to edges. Broodl ng areas in southeastern I daho are in relatively open areas with abundant herbaceous pl ant cover (Stauffer and Petersen 1985a).

Ruffed grouse diet consists primarily of plant matter. Pl ants consumed vary with species availability and seasonal distribution of the grouse. Aspen and poplars were l l sted as the princi pal foods in 17 different studies (Korschgen 1966). Winter foods consist largely of buds and twigs of trees. Aspen was the most important w l nter food source in Minnesota (Gul l lan 1967), while roseh ips were the most important wi nter food source In Utah (Phil l ips 1967).

In the spring, after the ground vegetation is exposed, foods become more diversif led. Grouse consume berries and fruits as they become avai l abl e throughout the sunmer and f al l. Sunmer f ruits consumed include strawberries (Fragaria spp.), raspberries (Rubus spp.), cherries (Prunus spp.), blueberries (Vaccinium spp.), and serv lceberries (Amel anch ler spp.). Fal l fruits Incl ude roses (Rosa spp.), viburnums (Viburnum spp.), red-osler dogwood (Cornus stolonifera), thornapples (Crataegus spp.), a n d sumacs (Rhus spp.) (Johnsgard 1983).

General ly, less than 10% of the adult ruffed grouse diet consists of animal matter, whereas it is a basic food item for young chicks (Edminister 1947). In the first ten days of l ife, 50 to 75% of the chick diet consists of insects and other invertebrates. Invertebrates consumed i ncl ude saw fl ies, Ichnuemon f l ies, beetl es, spiders, and grasshoppers (Bump et al. 1947).

Ring-necked Pheasant Ecology

The ring-necked pheasant was first introduced Into the United States in 1881 (Laucknart and McKean 1956). The species was first introduced Into Idaho in 1909 (Stephans 1908). Pheasants Inhabit primarily agricultural lands in the Pacific Northwest.

Pheasants require three cover types: grassland, woody or rank-growing herbaceous vegetation, and cropland. Grasslands are used mainly for nesting, crowing grounds, loafing cover, and food. Woody or rank-growing herbaceous vegetation is used primarily for thermal and/or escape cover. Croplands are valuable for food, especially during fall and winter (Edminster 1954).

Nesting and winter cover are probably the two most limiting factors for pheasants In the northwest (Lauckhart and McKean 1956, Galbreath 1973). Nesting cover includes gasses, alfalfa (Medicago sativa), weedy fields, roadsides, fencerows, and small grain fields (Edminster 1954). Alfalfa and ungrazed permanent herbaceous cover is preferred in north-central Colorado, while pasture and small grain fields are used less frequently (Lyon 1954). However, nesting success in alfalfa is generally low due to such factors as mowing, raking, and irrigation.

Wintering pheasants need adequate cover proximate to a food supply. Woody cover serves as adequate winter cover in Illinois (Hanson and Labisky 1964) and Montana (Weigand and Janson 1976). Other types of winter cover include dense weeds and cattails greater than 15 inches tall (Lyon 1954), roadsides, and drain ditches with residual cover (Hanson and Progulske 1973).

Pheasants depend largely on grain seeds to meet their food requirements. The most Important grain crops in the Northwest are barley, wheat, oats, and corn (Martin et al. 1951). Other food eaten includes ragweed (Ambrosia spp.) bristlegrass (Rigiopappus spp.), russian thistle (Salsola tenulfolia), dandelion (Taraxacum officinale), knotweeds (Polygonum spp.) and sunflowers (Helianthella spp.). Insects are an important part of pheasant chicks' diet (Ferrel et al. 1949, Trautman 1952, Edminster 1954), decreasing In Importance as the chicks reach adult size.

"Edges" of vegetation types are extremely important to pheasants. Optlmun pheasant range has all necessary cover types close to one another. The greater the interspersion of essential habitat types within an area, the greater the carrying capacity for pheasants. (Edminster 1954).

Spruce Grouse Ecology

Spruce grouse are non-migratory, gallinaceous birds associated with boreal forests (Aldrich 1963). Franklin's subspecies (D.c. franklinii) occurs in central Idaho north to southern British Columbia and east to central Alberta (Johnsgard 1983). Franklin spruce grouse use lodgepole pine stands (Stoneberg 1967, MacDonald 1968, Boag et al. 1979) or mixed stands of lodgepole pine and Douglas-fir (Paterni 1979, Herman 1980).

Franklin spruce grouse may prefer mixed stands of coniferous forest. In north-central Washington, spruce grouse occurred in stands of equal amounts of lodgepole pine and Engelmann spruce. However, Engelmann spruce density was the single most important variable for classification of spruce grouse habitat (Ratti et al. 1984).

Diet of the spruce grouse varies seasonally. In central Alberta, wintering Franklin spruce grouse eat lodgepole pine needles almost exclusively even though firs and spruce are also available (Pendergast and Boag 1970). At other times of the year, the diet consists mainly of plants growing on the forest floor. The Vaccinium species are important. Pendergast and Boag (1970) found that in the spring, spruce grouse actively seek Pinus, Picea, and Vaccinium. In the summer, they prefer Vaccinium, Equisetum, and Tiarella, and in the fall they again depend on Vaccinium.

Female spruce grouse may feed very selectively during incubation. Pendergast and Boag (1970) reported that the crop of a female spruce grouse collected during incubation, contained spruce (Picea spp.) buds only. They suggest that incubating females may actively select this food resource for nutritional reasons. McCourt et al. (1973) and Herzog (1978) also observed incubating female spruce grouse feeding consistently on new growth of spruce (P. glauca) in an area dominated by lodgepole pine.

Bald Eagle Ecology

The bald eagle is the only North American representative of the fish or sea eagles (Grossman and Hamlet 1964), and is endemic to North America. In the western U.S., wintering bald eagles congregate on major river systems (Steenhof 1978, Meyers 1979) and arid valleys (Steenhof 1978).

Breeding populations are associated with large rivers, lakes, and reservoirs in Idaho. The majority of bald eagles nest in eastern Idaho, primarily along Henry's Fork and South Fork of the Snake River. Other pairs nest near reservoirs in western and northern Idaho (Howard and VanDaele 1980).

Wintering bald eagles generally require open water, an adequate food supply, and suitable roost and perching sites. The most important habitat requirement is generally open water (Snow 1973, Steenhof 1978, Northern States Bald Eagle Recovery Team 1983,).

Roost and perch sites are usually not limiting in wintering areas. Suitable roost sites are generally located in tree species that protect the eagles from weather conditions (e.g. wind, rain) (Steenhof 1978). The most important characteristic of perch sites is proximity to water (Steenhof et al. 1980).

Breeding habitat requirements are similar to winter requirements with one exception. Again, proximity to water and adequate food sources are important (Snow 1973, GYE Bald Eagle Working Team 1983). Bald eagles also need adequate nest sites. Most nests occur in a variety of tree species (Table 1).

Table 18. Sane tree species bald eagles use for nesting.

Tree species	Source
Spruce (*Picea* spp.)	GYE 1983, Alt 1980
Cottonwood (*Populus* spp.)	GYE 1983, Alt 1980
Lodgepole pine (*Pinus contorta*)	GYE 1983, Alt 1980
Whitebark pine (*Pinus albicaulis*)	GYE 1983
Douglas-fir (*Pseudotsuga menziesii*)	GYE 1983, Howard and VanDaele 1980
Ponderosa pine (*Pinus ponderosa*)	Anthony et al. 1982

Bald eagles are opportunistic feeders. Generally, availability and vulnerability of prey dictates what is consumed (Fielder 1982). Eagles usually feed on prey that is dead, dying, or otherwise impaired, such as elk and deer carrion and crippled waterfowl (Steenhof 1978). However, they prefer fish when available (Snow 1973).

Loss of habitat and increased human activity are major factors limiting bald eagles. Destruction of wild areas through land development and increased human activity adversely affect wintering and breeding populations (Lint 1975, Northern States Bald Eagle Recovery Team 1983). Mortality caused by gunshot can be a limiting factor in areas of concentrated human use (Snow 1973, Steenhof 1978).

Osprey Ecology

Osprey distribution is extensive and nearly cosmopolitan. In the western U.S., ospreys breed in Alaska, Washington, Oregon, California, Idaho, Montana, and Wyoming (Zarn 1974). Most osprey winter in central America (Henny and VanVelzen 1972).

Osprey are primarily fish eaters but they will consume mammals, birds, reptiles, amphibians, and some invertebrates (Zarn 1974). Fish species taken depend on geographic location and fish species present. When available, spiny-ray fish are a major food source (Schroeder 1975).

Osprey nesting habitat must provide adequate nest sites and food supplies. Ideal nest sites, according to Zarn (1974), are located on top of dead snags and surrounded by water. In northern Idaho, Schroeder (1975) found that ospreys generally nest on tree tops with a view of the surrounding area. Nests occur on cottonwoods, dead conifers, live conifers, pilings, utility poles, and bridges. In west-central Idaho, VanDaele and VanDaele (1982) found that ospreys generally nest in dead snags.

Human activity can be detrimental to ospreys. Shooting is a major cause of osprey mortality in northern Idaho (Johnson and Melquist 1973). An increase in human population may cause an increase in numbers of ospreys shot. Human activity may also cause a decrease in productivity (Schroeder 1975, Levenson and Koplin 1984). VanDaele and VanDaele (1982) found that habituation to human activity varied depending on the frequency of disturbance. Ospreys nesting near humans tolerated their activities, while ospreys nesting farther from people were less tolerant.

Osprey populations are also limited by food availability. Prey availability or increased vulnerability may increase osprey production (Klavier et al. 1982). VanDaele and VanDaele (1982) reported that prey availability was the most important factor influencing osprey productivity in west-central Idaho. French (1972) observed that areas with an abundance of nest sites but low fish populations exhibited lower osprey densities than did locations with adequate supplies of food and nest sites.

Black-capped Chickadee Ecology

The black-capped chickadee is generally associated with wooded areas (Schroeder 1983) and is a common resident of southwestern Idaho (Stephens and Reynolds 1982, Collie 1983). Chickadees are "insect gleaners" and serve as important insect predators in forested areas (Sturman 1968). They are strongly territorial during the breeding season and flock during the rest of the year (Smith 1967).

Black-capped chickadees generally prefer deciduous or riparian woodlands (Dixon 1961, Larrison and Sonnenberg 1968, Sturman 1968). In southwestern Idaho, Stephens and Reynolds (1982) reported that both coniferous and deciduous woodlands were preferred cover types. Cadwallader (1980) found that black-capped chickadees were associated with riparian zones on the South Fork of the Boise River, in southern Idaho.

Canopy volume of trees appears to be an important factor in habitat selection by black-capped chickadees. In Washington, chickadee abundance was positively correlated with canopy volume (Sturman 1968). Stauffer and Best (1980) predict total elimination of black-capped chickadees from an area by total canopy removal, and adverse effects on density by partial canopy removal. According to Sturman (1968), canopy volume of trees may be used by chickadees to determine potential food supply.

Black-capped chickadees also need wooded areas for nesting. They are cavity nesters (Thomas et al. 1979, Stauffer and Best 1980), and nesting habitat is often limited by the number of available snags (Schroeder 1983). Cavities are generally excavated in soft or rotten wood (Odum 1941). Preferred nesting tree species are willows (*Salix* spp.), pines (*Pinus* spp.), and cottonwoods and poplars (*Populus* spp.) (Brewer 1961). Preferred diameters of snags range from 10-15 cm (Brewer 1963).

Yellow Warbler Ecology

The yellow warbler is a breeding bird throughout most of the United States. It is a common breeding bird in southwestern Idaho (Stephens and Reynolds 1982), and is primarily insectivorous (Bent 1953).

Preferred nesting habitats are generally wet areas with abundant shrubs or small trees (Schroeder 1982). Areas of extensive forest with closed canopies are generally avoided (Hebard 1961, Morse 1966), and areas of low deciduous growth 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). Less than 59% of extensive forested types (coniferous or deciduous) were used. 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 stream-side thickets (Larrison et al. 1967).

Yellow-rumped Warbler Ecology

The yellow-rumped warbler is a small insectivorous bird breeding in the more open conifer and mixed forests of Washington and Oregon (Larrison and Sonnenberg 1968). It is also a common breeding bird in the coniferous forests of southwestern Idaho.

The diet of this species consists largely of insects, supplemented by seeds and fruits during the fall and winter (Martin et al. 1951). Yellow-rumped warblers forage mainly by gleaning insects from dense foliage. Invertebrate prey taken includes ants, flies, scales and aphids, caterpillars, beetles, and spiders (Martin et al. 1951, Bent 1953).

KEY for Appendix D

1. Seasonal Use:

   R = Resident
   B = Breeder
   M = Migrant
   W = Winter

2. Relative Abundance:

   A = Abundant
   C = Common
   U = Uncommon
   R = Rare

3. Cover Type Descriptions:

   a. Deciduous Forested Wetland (DFW): dominated by woody vegetation that is 6 m (20 feet) tall or taller and has total vegetation cover greater than 30%.

   b. Deciduous Scrub-shrub Wetland (DSW): dominated by woody vegetation less than 6 m (20 feet) tall and has total vegetation cover greater than 30%.

   c. Evergreen Forest (EF): dominated by trees (taller than 5 m), and has a tree canopy of at least 25%.

   d. Evergreen Shrubland (ES): dominated by shrubs (including small trees shorter than 5 m) and has a shrub canopy cover of at least 25%.

   e. Rivers: refers to river proper, side channels, and tributaries where water flows most of the year. Dominant vegetation is mosses, algae, and rooted vascular plants that cling to rock surfaces.

   f. Lakes: (1) situated in a topographic depression or dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses, or lichens with greater than 30% aerial coverage; and (3) total area exceeds 8 ha (20 acres).

Appendix D: Wildlife species present in the general vicinity of the Anderson Ranch Project.

Common Name	Scientific Name	Cover Types				
		DFW & DSW	ES	EF	Rivers	Lakes
RATS AND MICE						
Western harvest mouse	*Reithrodontomys megalotis*		X	X		
Sawtooth white-footed mouse	*Peromyscus maniculatus serratus*	X	X	X		
Bushy-tailed woodrat	*Neotoma cinerea*		X	X		
Muskrat	*Ondatra zibethicus*	X			X	X
House mouse	*Mus musculus*	X				
Mountain vole	*Microtus montanus*	X				
Norway rat	*Rattus norvegicus*	X				
PORCUPINE	*Erethizon dorsatum*	X	X	X		
BEAVER	*Castor canadensis*	X		X	X	X
RACCOON	*Procyon lotor*	X	X			
CANIDS						
Coyote	*Canis latrans*	X	X	X		
Red fox	*Vulpes vulpes*	X	X	X		
CATS						
Mountain lion	*Felis concolor*	X	X	X		
Bobcat	*Felis rufus*	X	X	X		
BEARS						
Black bear	*Ursus americanus*	X		X		

Appendix D: [continued].

Common Name	Scientific Name	Cover Types				
		DFW & DSW	ES	EF	Rivers	Lakes
MUSTELIDS						
Long-tailed weasel	*Mustela frenata*	X		X		
Mink	*Mustela vison*	X			X	X
Badger	*Taxidea taxus*		X	X		
Western spotted skunk	*Spilogale gracilis*	X				
Striped skunk	*Mephitis mephitis*	X				
River otter	*Lutra canadensis*	X			X	X
CERVIDS						
Mule deer	*Odocoileus hemionus*	X	X	X		
Rocky Mountain elk	*Cervus elphus*	X	X	X		
SHREWS						
Dusky shrew	*Sorex monticolus*	X		X		
BATS						
Little brown bat	*Myotis lucifugus*	X		X	X	X
HARES AND RABBITS						
Pygmy rabbit	*Brachylagus idahoensis*		X			
Nuttall's cottontail	*Sylvilagus nuttallii*	X	X			
White-tailed jackrabbit	*Lepus townsendii*		X			
Black-tailed jackrabbit	*Lepus californicus*		X			
Snowshoe hare	*Lepus americanus*	X		X		

Appendix D: [continued].

Common Name	Scientific Name	DFW & DSW	ES	EF	Rivers	Lakes
SQUIRRELS AND GOPHERS						
Least chipmunk	*Tamis minimus*		X	X		
Yellow-bellied marmot	*Marmota flaviventris*		X			
Golden-manteled ground squirrel	*Spermophilus lateralis*			X		
Townsend's ground squirrel	*Spermophilus townsendii*		X			
Columbian ground squirrel	*Spermophilus columbianus*			X		
Red squirrel	*Tamiasciurus hudsonicus*	X		X		
Townsend's pocket gopher	*Thomomys townsendii*	X				
REPTILES						
Western fence lizard	*Sceloporus occidentalis*		X			
Common garter snake	*Thamnophis sirtalis*	X	X		X	X
Western garter snake	*Thamnophis elegans*	X	X		X	X
Racer	*Coluber constrictor*	X	X	X		
Gopher snake	*Pituophis melanoleucus*		X	X		
Night snake	*Hypsiglena torquata*		X			
Western rattlesnake	*Crotalus viridis*	X	X	X		
Rubber boa	*Charina bottae*	X	X	X		
AMPHIBIANS						
Western toad	*Bufo boreas*	X	X	X	X	X
Striped chorus frog	*Pseudacris triseriata*	X				
Spotted frog	*Rana pretiosa*	X			X	X
Tailed frog	*Ascaphus truei*	X			X	

Appendix D: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	EF	ES	Rivers	Lakes
VULTURES, HAWKS, EAGLES, AND FALCONS								
Cooper's hawk	R	U	X	X	X	X		
Sharp-shinned hawk	B	U	X	X	X	X		
Northern goshawk	MB	U	X	X	X	X		
Red-tailed hawk	R	C	X	X	X	X		
Swainson's hawk	B	U	X	X		X		
Rough-legged hawk	MW	C	X	X		X		
Ferruginous hawk	M	U	X	X				
Bald eagle	WB	C	X				X	X
Golden eagle	R	U			X	X		
Osprey	B	U	X				X	X
American kestrel	R	C	X	X		X		
Prairie falcon	R	U	X			X		
Turkey vulture	R	U	X	X	X	X		
Northern harrier	R	C				X		
Merlin	B	U				X		
OWLS								
Common barn-owl	R	C	X					
Northern pygmy-owl	R	U	X	X	X			
Great horned owl	R	C	X	X	X	X		
Long-eared owl	R	U	X	X	X			
GROUSE AND QUAIL								
Blue grouse	R	U	X	X	X	X		
Ruffed grouse	R	U	X	X	X			
Sage grouse	R	U				X		
California quail	R	C	X	X				
Mountain quail	R	U	X	X				
Chukar	R	C	X	X	X			
Gray partridge	R	U	X	X	X			
GOATSUCKERS								
Common nighthawk	B	C	X	X	X	X		
DOVES								
Rock dove	R	C					X	
Mourning dove	B	C	X	X			X	

Appendix D: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	EF	ES	Rivers	Lakes
SWIFTS								
White-throated swift	B	C			X	X	X	
HUMMINGBIRDS								
Rufous hummingbird	M	U	X	X	X			
KINGFISHERS								
Belted kingfisher	R	C	X				X	X
WOODPECKERS								
Northern flicker	R	C	X	X	X	X		
Lewis' woodpecker	M	C	X		X			
Downy woodpecker	R	C	X		X			
FLYCATCHERS								
Eastern kingbird	B	U	X	X		X		
Western kingbird	B	C	X	X		X		
Ash-throated flycatcher	B	U		X		X		
Eastern phoebe	M	R				X		
SWALLOWS								
Violet-green swallow	B	U	X	X		X	X	
Bank swallow	B	C				X	X	

Appendix D: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	EF	ES	Rivers	Lakes
SWALLOWS [continued]								
Cliff swallow	B	A			X	X	X	
Barn swallow	B	C				X	X	
CORVIDS								
Black-billed magpie	R	A	X	X		X		
Clark's nutcracker	R	C	X	X	X	X		
Common raven	R	C	X	X	X	X		
American crow	R	A	X	X		X		
Scrub jay	B	U	X			X		
Steller's jay	R	C	X		X			
VIREOS								
Warbling vireo	B	C	X	X				
Bell's vireo	B	U	X	X				
CHICKADEES								
Black-capped chickadee	R	C	X	X	X	X		
Mountain chickadee	R	C	X	X	X	X		
CREEPER								
Brown creeper	B	U	X		X			
WRENS								
Canyon wren	B	U				X		
Rock wren	B		X	X		X		
DIPPERS								
American dipper	R	U					X	

Appendix D: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	EF	ES	Rivers	Lakes
THRUSHES, SOLITAIRES AND BLUEBIRDS								
American robin	R	A	X	X	X	X		
Varied thrush	R	R	X		X	X		
Mountain bluebird	B	C	X	X	X	X		
KINGLETS AND GNATCATCHERS								
Ruby-crowned kinglet	B	C	X		X			
WAXWINGS								
Cedar waxwing	B	C	X	X	X			
SHRIKES								
Northern shrike	R	R	X	X		X		
WARBLERS								
Black-throated grey warbler	B	U	X	X				
Tennessee warbler	M	R	X	X				
Nashville warbler	B	U	X	X				
Yellow warbler	B	C	X	X				
Yellow-rumped warbler	B	C	X	X	X			
Northern waterthrush	R	R	X	X				
Common yellowthroat	B	U	X	X				
Yellow-breasted chat	B	C	X	X				
TANAGERS								
Western tanager	B	C	X	X	X			
BLACKBIRDS AND ORIOLES								
Northern oriole	B	C	X	X				
Brewer's blackbird	R	A	X	X	X	X		
Western meadowlark	B	C	X	X		X		
Bobolink	B	U	X	X				
Red-winged blackbird	R	C		X	X			

Appendix D: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	EF	ES	Rivers	Lakes
GROSBEAKS, SPARROWS, AND BUNTINGS								
Chipping sparrow	B	C	X	X	X			
Vesper sparrow	B	C			X	X		
Brewer's sparrow	B	A				X		
Lincoln's sparrow	B	U		X				
Sage sparrow	B	U				X		
Song sparrow	R	C	X	X		X		
Lazuli bunting	B	C	X	X		X		
American goldfinch	R	C	X	X				
Rufous-sided towhee	B	U	X	X		X		
Dark-eyed junco	R	C	X	X	X	X		
Rosy finch	W	U				X		
Lark sparrow	B	C	X	X		X		
Lesser goldfinch	B	U	X	X		X		
CRANES								
Sandhill crane	R	U				X	X	X
HERONS								
Great blue heron	R	C	X				X	X
PLOVERS								
Killdeer	B	C	X	X			X	X
GULLS								
Ring-billed gull	B	C				X	X	X
Franklin's gull	B	U	X	X				X
SANDPIPERS								
Spotted sandpiper	B	C	X	X			X	X
Least sandpiper	M	C					X	X

Appendix D: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	EF	ES	Rivers	Lakes
GEESE AND DUCKS								
Common merganser	R	U	X	X			X	X
Red-breasted merganser	M	U	X	X			X	X
Barrow's goldeneye	M	R	X	X			X	X
Common goldeneye	M	C	X	X			X	X
Ring-necked duck	M	U	X	X			X	X
Lesser scaup	M	U	X	X			X	X
Canvasback	M	U	X	X			X	X
Northern pintail	M	C	X	X			X	X
Green-winged teal	R	C	X	X			X	X
Blue-winged teal	M	U	X	X			X	X
Cinnamon teal	M	U	X	X			X	X
American wigeon	R	C	X	X			X	X
Mallard	R	C	X	X			X	X
Canada goose	M	U	X	X			X	X
Hooded merganser	W	U	X	X			X	X
Gadwall	R	U	X	X			X	X
Ruddy duck	M	U	X	X			X	X
Wood duck	B	R	X	X			X	
Snow goose	M	U	X	X			X	X

APPENDIX E

Results of mid-winter bald eagle counts conducted in the Anderson Ranch area during January 2-16, 1979-1984.

Location	Year	Number of Bald Eagles	Comments
South Fork of the Boise River upstream of the reservoir	1980		Not counted.
	1981	2	River upstream of reservoir mostly ice free, where river enters reservoir is iced over.
	1982	0	
	1983	4	
	1984	0	
On the reservoir	1980		Not counted.
	1981	5	Reservoir iced over from Lime Creek north.
	1982	0	Upper 1/2 reservoir iced over, lower 1/2 open.
	1983	2	Reservoir almost 100% iced over.
	1984		
	*1985	9	Immature bald eagles near Deer Creek.
South Fork of the Boise River downstream of the dam	1979	3	Cadwallader (1980).
	1980	3	Prey items: small groups of 15-20 ducks.
	1981	7	
	1982	13	
	1983	9	Prey items: few ducks, fish, little carrion.
	1984	7	Prey items: ducks, fish, dead deer.

* Observed on 10-31-85; all other counts conducted during "mid-winter survey" (January 2-16).

KEY: To Appendix F,G,, and I.

1. Seasonal Use:

R = Resident
B = Breeder
M = Migrant
W = Winter

2. Relative Abundance:

A = Abundant
C = Common
U = Uncommon
R = Rare

3. Cover Type Descriptions:

a. Deciduous Forested Wetland (DFW): dominated by wooded vegetation that is 6 m (20 feet) tall or taller and has total vegetation cover greater than 30%.

b. Deciduous Scrub-shrub Wetland (DSW): dominated by woody vegetation less than 6 m (20 feet) tall and has total vegetation cover greater than 30%.

c. Evergreen Shrubland (ES): dominated by shrubs (including small trees shorter than 5 m) and has a shrub canopy cover of at least 25%.

d. Rivers: refers to river proper, side channels, and tributaries where water flows most of the year. Dominant vegetation is mosses, algae, and rooted vascular plants that cling to rock surfaces.

e. Lakes: (1) situated in a topographic depression or dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses, or lichens with greater than 30% aeral coverage; and (3) total area exceeds 8 ha (20 acres).

f. Marsh: dominated by species that occur when standing water inhibits establishment of woody species.

g. Rocky Outcroppings: dominated by rock and generally lacking vegetation.

Appendix F: Wildlife species present in the Black Canyon Reservoir area.

Common Name	Scientific Name	Cover Types				
		DFW & DSW	ES	Rivers	Lakes	Rocky Outcroppings
RATS AND MICE						
Western harvest mouse	Reithrodontomys megalotis		X			
Deer mouse	Peromyscus maniculatus	X	X			X
Bushy-tailed woodrat	Neotoma cinerea		X			X
Muskrat	Ondatra zibethicus	X		X	X	
House mouse	Mus musculus	X				
Northern grasshopper mouse	Onychomys leucogaster		X			
Mountain vole	Microtus montanus	X	X			
Western jumping	Zapus princeps	X				
Chisel-toothed kangaroo rat	Dipodomys microps		X			
PORCUPINE	Erethizon dorsatum	X				
BEAVER	Castor canadensis	X		X	X	
RACCOON	Procyon lotor	X	X			
CANIDS						
Coyote	Canis latrans	X	X			
Red Fox	Vulpes vulpes	X	X			
CATS						
Bobcat	Felis rufus	X	X			X
MUSTELIDS						
Long-tailed weasel	Mustela frenata	X				X
Mink	Mustela vison	X		X	X	X
Badger	Taxidea taxus		X			

Appendix F: [continued].

Common Name	Scientific Name	Cover Types: DFW & DSW	ES	Rivers	Lakes	Rocky Outcroppings
MUSTELIDS [continued]						
Western spotted skunk	*Spilogale gracilis*	X				
Striped skunk	*Mephitis mephitis*	X				X
River otter	*Lutra canadensis*	X		X	X	
CERVIDS						
Mule deer	*Odocoileus hemionus*	X	X			
SHREWS						
Vagrant shrew	*Sorex vagrans*	X				
Water shrew	*Sorex palustris*			X	X	
HARES AND RABBITS						
Nuttall's cottontail	*Sylvilagus nuttallii*		X			X
Black-tailed jackrabbit	*Lepus californicus*		X			
White-tailed jackrabbit	*Lepus townsendii*		X			
Snowshoe hare	*Lepus americanus*	X	X			
Pygmy rabbit	*Brachylagus idahoensis*	X				
SQUIRRELS AND GOPHERS						
Fox squirrel	*Sciurus niger*	X				
Least chipmunk	*Tamias minimus*		X			X
Yellow-bellied marmot	*Marmota flaviventris*					X
Townsend's ground squirrel	*Spermophilus townsendii*		X			
Belding ground squirrel	*Spermophilus beldingi*		X			

Appendix G: [continued].

Common Name	Scientific Name	Cover Types: DFW & DSW	EF	River Channel	Lacustrine Lake	Meadows
MUSTELIDS						
Ermine	*Mustela erminea*	X				
Long-tailed weasel	*Mustela frenata*	X				
Mink	*Mustela vison*	X		X	X	
Striped skunk	*Mephitis mephitis*	X				
River otter	*Lutra canadensis*	X		X		
Marten	*Martes americana*		X			
CERVIDS						
Mule deer	*Odocoileus hemionus*	X	X			X
Rocky Mountain elk	*Cervus elaphus*	X	X			X
Moose	*Alces alces*	X	X			X
SHREWS						
Vagrant shrew	*Sorex vagrans*	X				
Masked shrew	*Sorex cinereus*	X				X
HARES AND RABBITS						
Snowshoe hare	*Lepus americanus*	X	X			X
SQUIRRELS AND GOPHERS						
Least chipmunk	*Tamias minimus*		X			X
Richardson's ground squirrel	*Spermophilus richardsonii*		X			
Columbian ground squirrel	*Spermophilus columbianus*		X			X
Golden-mantled ground squirrel	*Spermophilus lateralis*		X			
Red squirrel	*Tamiasciurus hudsonicus*	X	X			
Northern flying squirrel	*Glaucomys sabrinus*	X	X			
Northern pocket gopher	*Thomomys talpoides*	X				X

Appendix F: [continued].

Common Name	Scientific Name	Cover Types: DFW & DSW	ES	Rivers	Lakes	Rocky Outcroppings
REPTILES						
Mojave black-collared lizard	Crotaphytus bicinctores		X			X
Longnose leopord lizard	Gambelia wislizeni		X			X
Western fence lizard	Sceloporus occidentalis		X			X
Sagebrush lizard	Sceloporus graciosus		X			
Western whiptail	Cnemidophorus tigris		X			
Western skink	Eumeces skiltonianus	X	X			X
Common garter snake	Thamnophis sirtalis	X	X	X	X	
Western garter snake	Thamnophis elegans	X	X	X	X	
Racer	Coluber constrictor	X	X			
Gopher snake	Pituophis melanoleucus		X			
Western ground snake	Sonora semiannulata		X			
Night snake	Hypsiglena torquata		X			X
Western rattlesnake	Crotalus viridis	X	X			
Rubber boa	Charina bottae	X	X			
AMPHIBIANS						
Long-toed salamander	Ambystoma macrodactylum	X	X		X	
Tiger salamander	Ambystoma tigrinum	X	X			
Great Basin spadefoot	Spea intermontanus		X	X	X	
Western toad	Bufo boreas	X	X	X	X	
Woodhouse's toad	Bufo woodhousii	X	X	X	X	
Pacific treefrog	Hyla regilla	X	X	X	X	X
Striped chorus frog	Pseudacris triseriata	X		X	X	
Northern leopard frog	Rana pipiens	X		X	X	
Spotted frog	Rana pretiosa			X	X	
Bull frog	Rana catesbeiana			X	X	
Tailed frog	Ascaphus truei	X		X		

Appendix F: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	ES	Rivers	Lakes	Marsh
VULTURES, HAWKS, EAGLES, AND FALCONS								
Cooper's hawk	MBW	U	X	X	X			
Sharp-shinned hawk	M	U	X	X	X			
Northern goshawk	M	U	X	X	X			
Red-tailed hawk	R	C	X	X	X			
Swainson's hawk	M	U	X	X	X			
Rough-legged hawk	M	C	X	X	X			
Ferruginous hawk	M	U	X	X				
Bald eagle	MW	C	X			X		
Golden eagle	R	U			X			
Osprey	BM	U			X			
American kestrel	R	C	X	X	X			
Prairie falcon	R	U	X		X			X
Turkey vulture	R	U	X	X	X			X
Northern harrier	R	C			X			X
OWLS								
Short-eared owl	R	C			X			
Common barn-owl	R	C	X					X
Northern pygmy-owl	MW	R	X	X				
Great horned owl	R	C	X	X	X			
Northern saw-whet owl	MW	R	X	X				
Western screech-owl	R	U	X	X				
PHEASANT, GROUSE, AND QUAIL								
Ring-necked pheasant	R	C		X	X			X
California quail	R	C	X	X	X			
Gray partridge	R	U	X	X				
Chukar	R	C	X	X	X			
GOATSUCKERS								
Common nighthawk	MB	C	X	X	X			X
DOVES								
Rock dove	R	C				X		
Mourning dove	B	C	X	X	X	X		

Appendix F: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	ES	Rivers	Lakes	Marsh
HUMMINGBIRDS								
Calliope hummingbird	MB	U	X	X	X			
Rufous hummingbird	M	U	X	X				
Black-chinned hummingbird	MB	C	X	X				
KINGFISHERS								
Belted kingfisher	R	C	X			X	X	
WOODPECKERS								
Northern flicker	R	C	X	X	X			
Lewis' woodpecker	M	U	X					
Downy woodpecker	R	C	X					
Hairy woodpecker	R	C	X					
Yellow-bellied sapsucker	M	U	X					
FLYCATCHERS								
Hammond's flycatcher	M	U	X	X	X			
Western flycatcher	M	R	X	X				
Western kingbird	MB	C	X	X	X			
Say's phoebe	M	U	X	X				
Western wood-pewee	MB	C	X	X				
Willow flycatcher	MB	U	X	X				
Dusky flycatcher	M	U	X	X				
Olive-sided flycatcher	MB	U	X	X				
Ash-throated flycatcher	B	U			X			
SWALLOWS								
Northern rough-winged swallow	MB	C				X	X	X
Violet-green swallow	MB	U	X		X	X	X	X
Bank swallow	MB	C			X	X	X	X
Cliff swallow	MB	A			X	X	X	X
Barn swallow	MB	C			X	X	X	X
Tree swallow	MB	U	X			X	X	X

Appendix F: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	ES	Rivers	Lakes	Marsh
CORVIDS								
Black-billed magpie	R	A	X	X	X			
Clark's nutcracker	M	C	X		X			
Common raven	R	C	X	X	X			
American crow	R	A	X	X	X			
CHICKADEES								
Black-capped chickadee	R	C	X	X	X			
Mountain chickadee	MW	C	X	X	X			
CREEPERS								
Brown creeper	MW	U	X					
WRENS								
Winter wren	M	C	X	X				
House wren	MB	C	X	X				
Rock wren	B	C			X	X		
Canyon wren	B	U			X	X		
Marsh wren	R	C						X
THRUSHES, SOLITAIRES, AND BLUEBIRDS								
American robin	R	A	X	X	X			
Varied thrush	M	R	X					
Townsend's solitaire	MW	U	X					
Hermit thrush	M	C	X					
Swainson's thrush	M	U	X					
Mountain bluebird	M	U	X	X				
Veery	B	U	X	X				
KINGLETS AND GNATCATCHERS								
Golden-crowned kinglet	MW	U	X					
Ruby-crowned kinglet	MB	C	X					

Appendix F: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	ES	Rivers	Lakes	Marsh
THRASHERS								
Sage thrasher	B	C			X			
WAXWINGS								
Cedar waxwing	R	C	X	X				
Bohemian waxwing	W	R	X	X				
LARKS								
Horned lark	R	C			X			
STARLINGS								
European sterling	R	C	X	X				
NUTHATCHES								
White-breasted nuthatch	R	U	X	X				
Red-breasted nuthatch	R	C	X	X				
SHRIKES								
Loggerhead shrike	B	U	X	X	X			
Northern shrike	M	R	X	X	X			
VIREOS								
Solitary vireo	B	U	X					
Warbling vireo	B	C	X	X				
WARBLERS								
MacGillivray's warbler	M	U	X	X				
Wilson's warbler	M	C	X	X				
Yellow warbler	M	B	X	X				
Yellow-rumped warbler	BW	C	X	X				
Yellow-breasted chat	MB	C	X	X				

Appendix F: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	ES	Rivers	Lakes	Marsh
TANAGERS								
Western tanager	M	U	X	X				
BLACKBIRDS AND ORIOLES								
Yellow-headed blackbird	MB	C		X				X
Northern oriole	MB	U	X	X				
Brewer's blackbird	MB	A	X	X	X			
Western meadowlark	R	C			X			
Red-winged blackbird	MB	C	X	X	X			X
GROSBEAKS, SPARROWS, AND BUNTINGS								
Vesper sparrow	B	C			X			
Brewer's sparrow	B	C			X			
Savannah sparrow	M	U	X	X	X			
Chipping sparrow	MB	C	X	X				
White-crowned sparrow	MW	C	X	X	X			
Song sparrow	R	C	X	X	X			X
Lazuli bunting	MB	C	X	X	X			
American goldfinch	R	C	X	X				
Black-headed grosbeak	MB	U	X	X				
Evening grosbeak	MW	C	X	X				
House finch	R	C	X	X	X			
Cassin's finch	MW	U	X	X				
Pine siskin	MW	U	X					
Rufous-sided towhee	MB	U	X	X	X			
Green-tailed towhee	M	U			X			
Dark-eyed junco	MW	C	X	X	X			
Lark sparrow	M	U	X	X	X			
Sage sparrow	B				X			
RAILS								
Sora	R	U						X
American coot	R	U					X	X
Virginia rail	R	U						X
HERONS AND EGRETS								
Great blue heron	R	C	X			X	X	X
Sandhill crane	M	U				X	X	X

Appendix F: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	ES	Rivers	Lakes	Marsh
PLOVERS								
Killdeer	R	C	X	X		X	X	
GULLS								
Ring-billed gull	B	C			X	X	X	X
California gull	M	C				X	X	X
SNIPES AND SANDPIPERS								
Wilson's phalarope	M	R					X	X
Long-billed curlew	MB	U						X
Solitary sandpiper	M	R						X
Common snipe	R	C						X
Spotted sandpiper	MB	C				X		
Greater yellowlegs	MB	U				X		X
Lesser yellowlegs	MB	U				X		X
GEESE AND DUCKS								
Common merganser	R	U				X	X	
Red-breasted merganser	M	U				X	X	X
Barrow's goldeneye	M	R				X	X	X
Common goldeneye	M	U				X	X	X
Lesser scaup	M	U				X	X	
Canvasback	M	U				X	X	X
Northern pintail	M	U				X	X	
Green-winged teal	MB	C				X	X	X
Blue-winged teal	M	U				X	X	X
Cinnamon teal	MB	C				X	X	X
American wigeon	B	C				X	X	X
Mallard	R	C	X	X		X	X	X
Canada goose	R	C	X	X		X	X	X
Hooded merganser	WM	R				X	X	X
Redhead	M	U				X	X	X
Ruddy duck	B	U				X	X	X
Wood duck	MB	C	X			X		X
Eared grebe	M	R				X	X	X
Western grebe	M	U				X	X	X
Pied-billed grebe	MB	U					X	X
Double-crested cormorant	MW	U	X			X	X	X
Tundra swan	M	U				X	X	
Gadwall	B	C	X	X		X	X	X

Appendix G: Wildlife species present in the IDFG management unit 34, including Deadwood Reservoir.

Common Name	Scientific Name	Cover Types				
		DFW & DSW	EF	River Channel	Lacustrine Lake	Meadows
RATS AND MICE						
Western harvest mouse	Reithrodontomys megalotis		X			X
Deer mouse	Peromyscus maniculatus	X				X
Bushy-tailed woodrat	Neotoma cinerea		X			X
Muskrat	Ondatra zibethicus	X		X	X	
House mouse	Mus musculus	X				
Meadow jumping mouse	Zapus hudsonius	X	X			
Western jumping mouse	Zapus princeps	X	X			X
Montane vole	Microtus montanus	X				X
PORCUPINE	Erethizon dorsatum	X	X			
BEAVER	Castor canadensis	X	X	X	X	
RACCOON	Procyon lotor	X				
BEARS						
Black bear	Ursus americanus	X	X			X
CANIDS						
Wolf	Canis lupus	X	X			X
Coyote	Canis latrans	X	X			
CATS						
Mountain lion	Felis concolor	X	X			
Bobcat	Felis rufus	X	X			

Appendix G: [continued].

Common Name	Scientific Name	Cover Types: DFW & DSW	EF	River Channel	Lacustrine Lake	Meadows
MUSTELIDS						
Ermine	Mustela erminea	X				
Long-tailed weasel	Mustela frenata	X				
Mink	Mustela vison	X		X	X	
Striped skunk	Mephitis mephitis	X				
River otter	Lutra canadensis	X		X		
Marten	Martes americana		X			
CERVIDS						
Mule deer	Odocoileus hemionus	X	X			X
Rocky Mountain elk	Cervus elaphus	X	X			X
Moose	Alces alces	X	X			X
SHREWS						
Vagrant shrew	Sorex vagrans	X				
Masked shrew	Sorex cinereus	X				X
HARES AND RABBITS						
Snowshoe hare	Lepus americanus	X	X			X
SQUIRRELS AND GOPHERS						
Least chipmunk	Tamias minimus		X			X
Richardson's ground squirrel	Spermophilus richardsonii		X			
Columbian ground squirrel	Spermophilus columbianus		X			X
Golden-mantled ground squirrel	Spermophilus lateralis		X			
Red squirrel	Tamiasciurus hudsonicus	X	X			
Northern flying squirrel	Glaucomys sabrinus	X	X			
Northern pocket gopher	Thomomys talpoides	X				X

Appendix G: [continued].

Common Name	Scientific Name	Cover Types				
		DFW & DSW	EF	River Channel	Lacustrine Lake	Meadows
REPTILES						
Common garter snake	*Thamnophis sirtalis*	X		X	X	
Western garter snake	*Thamnophis elegans*	X		X	X	
Rubber boa	*Charina bottae*	X	X			
AMPHIBIANS						
Pacific giant salamander	*Dicamptodon ensatus*	X	X	X		
Long-toed salamander	*Ambystoma macrodactylum*	X	X		X	X
Western toad	*Bufo boreas*	X	X	X	X	X
Pacific treefrog	*Hyla regilla*	X	X	X	X	X
Striped chorus frog	*Pseudacris triserata*	X		X	X	X
Northern leopard frog	*Rana pipiens*	X		X	X	X
Spotted frog	*Rana pretiosa*			X	X	
Tailed frog	*Ascaphus truei*		X	X		

Appendix G: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	EF	Rivers	Lakes
VULTURES, HAWKS, EAGLES, AND FALCONS							
Cooper's hawk	R	U	X	X	X		
Sharp-shinned hawk	B	U	X	X	X		
Northern goshawk	MB	U	X	X	X		
Red-tailed hawk	R	C	X	X	X		
Swainson's hawk	B	U	X	X			
Rough-legged hawk	MW	U	X	X			
Ferruginous hawk	M	U	X	X			
Bald eagle	WB	U	X			X	X
Golden eagle	R	U			X		
Osprey	B	U	X			X	X
American kestrel	R	C	X	X			
Northern harrier	R	U					
OWLS							
Great horned owl	R	U	X	X	X		
Northern saw-whet owl	R	U	X	X	X		
Western screech-owl	R	U	X	X	X		
GROUSE AND QUAIL							
Spruce grouse	R	C	X		X		
Blue grouse	R	C	X	X	X		
Ruffed grouse	R	C	X	X	X		
GOATSUCKERS							
Common nighthawk	B	C	X	X	X		
DOVES							
Mourning dove	B	C	X	X		X	
HUMMINGBIRDS							
Broad-tailed hummingbird	M	U	X	X	X		
Rufous hummingbird	M	U	X	X	X		

Appendix G: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	EF	Rivers	Lakes
KINGFISHERS							
Belted kingfisher	R	C	X			X	X
WOODPECKERS							
Hairy woodpecker	R	U	X		X		
Northern flicker	R	C	X	X	X		
Lewis' woodpecker	M	U	X		X		
Downy woodpecker	R	U	X		X		
Pileated woodpecker	R	U	X		X		
FLYCATCHERS							
Willow flycatcher	B	U	X	X			
Olive-sided flycatcher	MB	U	X		X		
Western wood-pewee	MB	U	X		X		
Western kingbird	B	U	X	X			
Say's phoebe	B	U		X			
SWALLOWS							
Northern rough-winged swallow	MB	U	X	X	X	X	X
Violet-green swallow	MB	U	X	X		X	
Cliff swallow	MB	A			X	X	
Tree swallow	MB	U	X	X	X	X	X
CORVIDS							
Black-billed magpie	R	C	X	X			
Clark's nutcracker	R	A	X	X	X		
Common raven	R	C	X	X	X		
American crow	R	U	X	X			
Steller's jay	R	U	X		X		
Gray jay	R	C	X	X	X		
VIREOS							
Warbling vireo	B	U	X	X			

Appendix G: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	EF	Rivers	Lakes
CHICKADEES							
Black-capped chickadee	R	U	X	X	X		
Mountain chickadee	R	C	X	X	X		
NUTHATCHES							
White-breasted nuthatch	R	C	X	X	X		
Red-breasted nuthatch	R	C	X		X		
Pygmy nuthatch	R	R			X		
CREEPERS							
Brown creeper	B	U	X		X		
WRENS							
Winter wren	W	U	X	X	X		
Rock wren	B	U	X	X			
House wren	B	U	X	X	X		
MOCKINGBIRDS							
Gray catbird	B	U	X	X			
DIPPERS							
Dipper	R	U				X	
THRUSHES, SOLITAIRES, AND BLUEBIRDS							
Veery	B	U					
American robin	R	A	X	X	X		
Swainson's thrush	MB	U					
Varied thrush	R	R	X		X		
Hermit thrush	MB	U					
Mountain bluebird	B	C	X	X	X		
Townsend's solitaire	R	U					

Appendix G: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	EF	Rivers	Lakes
KINGLETS AND GNATCATCHERS							
Ruby-crowned kinglet	B	U	X		X		
Golden-crowned kinglet	BW	C	X		X		
WAXWINGS							
Bohemian waxwing	M	U	X	X	X		
SHRIKES							
Northern shrike	M	U	X	X			
Loggerhead shrike	B	U	X	X			
WARBLERS							
MacGillivray's warbler	B	U	X	X			
Yellow warbler	B	U	X	X			
Yellow-rumped warbler	B		X	X	X		
Townsend's warbler	MB	U	X		X		
Wilson's warbler	MB	U	X	X			
TANAGERS							
Western tanager	B	U	X	X	X		
BLACKBIRDS AND ORIOLES							
Northern oriole	B	U	X	X			
Brewer's blackbird	R	U	X	X	X		
Western meadowlark	B	U	X	X			
Red-winged blackbird	R	U		X	X		
Yellow-headed blackbird	B	U	X	X			
GROSBEAKS, SPARROWS, AND BUNTINGS							
Chipping sparrow	B	C	X	X	X		
Brewer's sparrow	B	U					
Song sparrow	R	U	X	X			
Lazuli bunting	B	C	X	X			
American goldfinch	R	U	X	X			
Rufous-sided towhee	B	U	X	X			

Appendix G: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	EF	Rivers	Lakes
GROSBEAKS, SPARROWS, AND BUNTINGS (continued)							
Dark-eyed junco	R	C	X	X	X		
Cassin's finch	B	U					
House finch	R	U	X	X	X		
Black-headed grosbeak	B	U	X	X			
Evening grosbeak	MW	U	X	X	X		
Pine siskin	MW	A	X		X		
Red crossbill	R	U			X		
White-winged crossbill	W	U			X		
Green-tailed towhee	M	U	X		X		
Fox sparrow		U	X	X	X		
White-crowned sparrow	MW	U	X	X	X		
CRANES							
Sandhill crane	M	U				X	X
HERONS AND BITTERNS							
Great blue heron	R	C	X			X	X
Snowy egret	B	U	X	X			X
Black-crowned night-heron	R	U	X	X			X
American bittern	B	U					X
PLOVERS							
Killdeer	B	U	X	X		X	X
SANDPIPERS							
Spotted sandpiper	B	U	X	X		X	X
Least sandpiper	M	C				X	X
AVOCETS AND STILTS							
American avocet							X
GREBES							
Eared grebe	X	M	U				
Western grebe	M	U					X
Pied-billed grebe	M	U				X	X

Appendix G: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	EF	Rivers	Lakes
GEESE AND DUCKS							
Common merganser	M	U	X	X		X	X
Barrow's goldeneye	M	U	X	X		X	X
Common goldeneye	M	C	X	X		X	X
Ring-necked duck	M	U	X	X		X	X
Lesser scaup	M	U	X	X		X	X
Canvasback	M	U	X	X		X	X
Northern pintail	M	U	X	X		X	X
Cinnamon teal	MB	U	X	X		X	X
American wigeon	M	C	X	X		X	X
Mallard	M	C	X	X		X	X
Canada goose	M	U	X	X		X	X
Hooded merganser	W	U	X	X		X	X
Gadwall	M	U	X	X		X	X
Ruddy duck	M	U	X	X		X	X
Wood duck	MB	U	X	X		X	
Northern shoveler	M	U				X	X
Redhead	M	U				X	X
Greater scaup	W	R				X	X
Bufflehead	M	U				X	X
Tundra swan	M	U				X	X

Appendix H: Wildlife species present near the Boise River. (Caldwell and Wells 1974, U.S. Army Corps of Engineers 1974, Kading 1983, and Sather-Blair and Blair 1983).

Common Name	Scientific Name	Cover Types: DFW & DSW	ES	Rivers	Lakes	Rocky Outcroppings
RATS AND MICE						
Great Basin pocket mouse	*Perognathus parvus*		X			
Ord's kangaroo rat	*Dipodomys ordii*		X			
Western harvest mouse	*Reithrodontomys megalotis*		X			
Deer mouse	*Peromyscus maniculatus*	X	X			X
Northern grasshopper mouse	*Onychomus leucogaster*		X			
Desert woodrat	*Neotoma lepida*		X			
Bushy-tailed woodrat	*Neotoma cinerea*		X			X
Sagebrush vole	*Lemmiscus curtatus*		X			
Mountain vole	*Microtus montanus*	X				
Muskrat	*Ondatra zibethicus*	X		X	X	
House mouse	*Mus musculus*	X				
Western jumping mouse	*Zapus princeps*	X				
PORCUPINE	*Erethizon dorsatum*	X				
BEAVER	*Castor canadensis*	X		X	X	
RACCOON	*Procyon lotor*	X	X			
CANIDS						
Coyote	*Canis latrans*	X	X			
Red fox	*Vulpes vulpes*	X	X			X
CATS						
Mountain lion	*Felis concolor*	X	X			X
Bobcat	*Felis rufus*	X	X			X

Appendix H: [continued].

Common Name	Scientific Name	Cover Types: DFW & DSW	ES	Rivers	Lakes	Rocky Outcroppings
MUSTELIDS						
Ermine	*Mustela erminea*	X				
Long-tailed weasel	*Mustela frenata*	X	X			
Mink	*Mustela vison*	X		X	X	
Badger	*Taxidea taxus*		X			
Western spotted skunk	*Spilogale gracilis*	X				
Striped skunk	*Mephitis mephitis*	X				X
River otter	*Lutra canadensis*	X		X	X	
CERVIDS						
Mule deer	*Odocoileus hemionus*	X	X			
SHREWS						
Vagrant shrew	*Sorex vagrans*	X				
Water shrew	*Sorex palustris*			X	X	
Masked shrew	*Sorex cinereus*	X				
BATS						
Little brown bat	*Myotis lucifugus*	X		X	X	
Yuma myotis	*Myotis yumanensis*		X	X	X	
Long-eared myotis	*Myotis evotis*	X	X			
Fringed myotis	*Myotis thysanodes*	X	X			
California myotis	*Myotis californicus*					X
Small-footed myotis	*Myotis leibii*	X				
Silver-haired bat	*Lasionycteris noctivagans*	X		X	X	
Western pipistrelle	*Pipistrellus hesperus*			X	X	X
Big brown bat	*Eptesicus fuscus*	X				X
Hoary bat	*Lasiurus cinereus*	X				
Townsend's big-eared bat	*Plecotus townsendii*					X

Appendix H: [continued].

Common Name	Scientific Name	Cover Types: DFW & DSW	ES	Rivers	Lakes	Rocky Outcroppings
HARES AND RABBITS						
Pygmy rabbit	Brachylagus idahoensis		X			X
Nuttall's cottontail	Sylvilagus nuttallii	X	X			
White-tailed jackrabbit	Lepus townsendii		X			
Black-tailed jackrabbit	Lepus californicus		X			
SQUIRRELS AND GOPHERS						
Least chipmunk	Tamias minimus		X			X
Yellow-bellied marmot	Marmota flaviventris					X
Townsend's ground squirrel	Spermophilus townsendii		X			
Richardson's ground squirrel	Spermophilus richardsonii		X			
Red squirrel	Tamiasciurus hudsonicus	X				
Northern flying squirrel	Glaucomys sabrinus	X				
Northern pocket gopher	Thomomys talpoides		X			
Townsend's pocket gopher	Thomomys townsendii		X			
REPTILES						
Desert horned lizard	Phrynosoma platyrhinos		X			
Short-horned lizard	Phrynosoma douglassii		X			
Mojave black-collared lizard	Crotaphytus bicinctores		X			X
Longnose leopord lizard	Gambelia wislizeni		X			X
Western fence lizard	Sceloporus occidentalis		X			X
Sagebrush lizard	Sceloporus graciosus		X			
Side-blotched lizard	Uta stansburiana		X			
Western whiptail	Cnemidophorus tigris		X			
Western skink	Eumeces skiltonianus	X	X			X
Common garter snake	Thamnophis sirtalis	X	X	X	X	
Western garter snake	Thamnophis elegans	X	X	X	X	

Appendix H: [continued].

Common Name	Scientific Name	Cover Types: DFW & DSW	ES	Rivers	Lakes	Rocky Outcroppings
REPTILES [continued]						
Ringneck snake[1]	*Diadophis punctatus*	X	X			X
Racer	*Coluber constrictor*	X	X			
Gopher snake	*Pituophis melanoleucus*		X			
Western ground snake[1]	*Sonora semiannulata*		X			
Night snake[1]	*Hypsiglena torquata*		X			X
Western rattlesnake	*Crotalus viridis*	X	X			
Rubber boa	*Charina bottae*	X	X			
AMPHIBIANS						
Long-toed salamander[1]	*Ambystoma macrodactylum*	X	X		X	
Great Basin spadefoot[1]	*Spea intermontanus*		X	X	X	
Western toad	*Bufo boreas*	X	X	X	X	
Woodhouse's toad	*Bufo woodhousii*	X	X	X	X	
Pacific treefrog[1]	*Hyla regilla*	X	X	X	X	X
Striped chorus frog[1]	*Pseudacris triseriata*	X		X	X	
Northern leopard frog	*Rana pipiens*	X		X	X	
Spotted frog[1]	*Rana pretiosa*			X	X	
Bull frog[2]	*Rana catesbeiana*			X	X	

1 Limited numbers present today.
2 Introduced species.

Appendix H: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	ES	Rivers	Lakes	Marshes
VULTURES, HAWKS, EAGLES, AND FALCONS								
Cooper's hawk	MBW	U	X	X	X			
Sharp-shinned hawk	M	U	X	X	X			
Northern goshawk	M	U	X	X	X			
Red-tailed hawk	R	C	X	X	X			
Swainson's hawk	M	U	X	X	X			
Rough-legged hawk	M	C	X	X	X			
Ferruginous hawk	M	U	X	X				
Bald eagle	MW	C	X			X		
Golden eagle	R	U			X			
Osprey	BM	U			X			
American kestrel	R	C	X	X	X			
Prairie falcon	R	U	X		X			X
Turkey vulture	R	U	X	X	X			X
Northern harrier	R	C			X			X
OWLS								
Burrowing owl	B	U			X			
Short-eared owl	R	C			X			
Common barn-owl	R	C	X					X
Northern pygmy-owl	MW	R	X	X				
Great horned owl	R	C	X	X	X			
Long-eared owl	R	U	X	X				
Northern saw-whet owl	MW	R	X	X				
Western screech-owl	R	U	X	X				
PHEASANT, GROUSE, AND QUAIL								
Ring-necked pheasant	R	C		X	X			X
California quail	R	C	X	X	X			
Gray partridge	R	U	X	X				
Chukar	R	U	X	X	X			
GOATSUCKERS								
Common nighthawk	MB	C	X	X	X			X
Common poorwill	B	U			X			
DOVES								
Rock dove	R	C				X		
Mourning dove	B	C	X	X	X	X		

Appendix H: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	ES	Rivers	Lakes	Marshes
HUMMINGBIRDS								
Calliope hummingbird	MB	U	X	X	X			
Rufous hummingbird	M	U	X	X				
Black-chinned hummingbird	MB	C	X	X				
Anna's hummingbird	M	U	X	X				
Broad-tailed hummingbird	M	C	X	X				
KINGFISHERS								
Belted kingfisher	R	C	X			X	X	
WOODPECKERS								
Northern flicker	R	C	X	X	X			
Lewis' woodpecker	M	U	X					
Downy woodpecker	R	C	X					
Hairy woodpecker	R	C	X					
Yellow-bellied sapsucker	M	U	X					
FLYCATCHERS								
Hammond's flycatcher	M	U	X	X	X			
Western flycatcher	M	R	X	X				
Eastern kingbird	M	U	X	X	X			
Western kingbird	MB	C	X	X	X			
Say's phoebe	M	U	X	X				
Western wood-pewee	MB	C	X	X				
Willow flycatcher	MB	U	X	X				
Dusky flycatcher	M	U	X	X				
SWALLOWS								
Northern rough-winged swallow	MB	C				X	X	X
Violet-green swallow	MB	U	X		X	X	X	X
Bank swallow	MB	C			X	X	X	X
Cliff swallow	MB	A			X	X	X	X
Barn swallow	MB	C			X	X	X	X
Tree swallow	MB	U	X			X	X	X

Appendix H: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	ES	Rivers	Lakes	Marshes
CORVIDS								
Black-billed magpie	R	A	X	X	X			
Clark's nutcracker	M	C	X		X			
Common raven	R	C	X	X	X			
American crow	R	A	X	X	X			
CHICKADEES								
Black-capped chickadee	R	C	X	X	X			
Mountain chickadee	MW	C	X	X	X			
CREEPERS								
Brown creeper	MW	U	X					
WRENS								
House wren	MB	C	X	X				
Rock wren	B	C			X	X		
Canyon wren	B	U			X	X		
Marsh wren	R	C						X
DIPPERS								
Dipper	R	U				X		
THRUSHES, SOLITAIRES, AND BLUEBIRDS								
American robin	R	A	X	X	X			
Varied thrush	M	R	X					
Townsend's solitaire	MW	U	X					
Hermit thrush	M	C	X					
Swainson's thrush	M	U	X					
Mountain bluebird	M	U	X	X				
KINGLETS AND GNATCATCHERS								
Golden-crowned kinglet	MW	U	X					
Ruby-crowned kinglet	MB	C	X					
Blue-gray gnatcatcher	MB	R	X					

Appendix H: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	ES	Rivers	Lakes	Marshes
THRASHERS								
Sage thrasher	B	C			X			
WAXWINGS								
Cedar waxwing	R	C	X	X				
Bohemian waxwing	W	R	X	X				
LARKS								
Horned lark	R	C			X			
STARLINGS								
European starling	R	C	X					
NUTHATCHES								
White-breasted nuthatch	R	U	X					
Red-breasted nuthatch	R	C	X					
SHRIKES								
Loggerhead shrike	MB	U	X	X	X			
Northern shrike	MW	R	X	X	X			
VIREOS								
Solitary vireo	M	U	X					
Warbling vireo	MB	C	X	X				
WARBLERS								
MacGillivray's warbler	M	U	X	X				
Wilson's warbler	M	C	X	X				
Nashville warbler	M	U	X	X				
Yellow warbler	M	B	X	X				
Yellow-rumped warbler	BW	C	X	X				
Common yellowthroat	MB	R	X	X				X
Yellow-breasted chat	MB	C	X	X				

Appendix H: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	ES	Rivers	Lakes	Marshes
TANAGERS								
Western tanager	M	U	X	X				
BLACKBIRDS AND ORIOLES								
Yellow-headed blackbird	MB	C		X				X
Northern oriole	MB	U	X	X				
Brewer's blackbird	MB	A	X	X	X			
Western meadowlark	R	C			X			
Red-winged blackbird	MB	C	X	X	X			X
GROSBEAKS, SPARROWS, AND BUNTINGS								
Savannah sparrow	M	U	X	X	X			
Chipping sparrow	MB	C	X	X				
White-crowned sparrow	MW	C	X	X	X			
Song sparrow	R	C	X	X	X			X
Lazuli bunting	MB	C	X	X	X			
American goldfinch	R	C	X	X				
Black-headed grosbeak	MB	U	X	X				
Evening grosbeak	MW	C	X	X				
House finch	R	C	X	X	X			
Cassin's finch	MW	U	X	X				
Pine siskin	MW	U	X					
Rufous-sided towhee	MB	U	X	X	X			
Green-tailed towhee	M	U	X					
Dark-eyed junco	MW	C	X	X	X			
Lark sparrow	M	U	X	X	X			
RAILS								
Sora	R	U						X
American coot	R	U					X	X
Virginia	R	U						X
HERONS AND EGRETS								
Black-crowned night heron	MB	U	X			X	X	X
Great blue heron	R	C	X			X	X	X
Snowy egret	MB	U	X	X				X
Common egret	M	R						X

Appendix H: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	ES	Rivers	Lakes	Marshes
PLOVERS								
Killdeer	R	C	X	X		X	X	
GULLS								
Bonaparte's gull	M	U				X	X	X
Ring-billed gull	R	C			X	X	X	X
California gull	M	C				X	X	X
TERNS								
Forster's tern	M	R						X
SNIPES AND SANDPIPERS								
Wilson's phalarope	M	R					X	X
Long-billed dowitcher	M	R						X
Long-billed curlew	M	U						X
Solitary sandpiper	M	R						X
Common snipe	R	C						X
Spotted sandpiper	MB	C				X		
Willet	M	R						X
Greater yellowlegs	MB	U				X		X
Lesser yellowlegs	MB	U				X		X
GEESE AND DUCKS								
Common merganser	R	U				X	X	
Red-breasted merganser	M	U				X	X	X
Barrow's goldeneye	M	R				X	X	X
Common goldeneye	M	U				X	X	X
Lesser scaup	M	U				X	X	
Canvasback	M	U				X	X	X
Northern pintail	M	U				X	X	
Green-winged teal	MB	C				X	X	X
Blue-winged teal	M	U				X	X	X
Cinnamon teal	MB	C				X	X	X
American wigeon	MW	C				X	X	X
Mallard	R	C	X	X		X	X	X
Canada goose	MB	C	X	X		X	X	X
Hooded merganser	WM	R				X	X	X
Redhead	M	U				X	X	X

Appendix H: [continued].

SPECIES	Seasonal Use	Relative Abundance	COVER TYPES DFW	DSW	ES	Rivers	Lakes	Marshes
GEESE AND DUCKS [continued]								
Ruddy duck	M	U				X	X	X
Wood duck	MB	C	X			X		X
Eared grebe	M	R				X	X	X
Western grebe	M	U				X	X	X
Pied-billed grebe	MB	U					X	X
Double-crested cormorant	MW	U	X			X	X	X
Tundra swan	M	U				X	X	

Appendix I

Formal Comments

United States Department of the Interior

BUREAU OF RECLAMATION
PACIFIC NORTHWEST REGION
FEDERAL BUILDING & U.S. COURTHOUSE
BOX 043-550 WEST FORT STREET
BOISE, IDAHO 88724

IN REPLY REFER TO PN 150
565.

APR 21 1986

Allyn Meuleman
Idaho Department of Fish and Game
600 South Walnut, Box 25
Boise, Idaho 83707

Dear Ms. Meuleman:

This is in response to your letter of March 28, 1986, which transmitted the report on Anderson Ranch, Black Canyon, and Boise Diversion Dam for our review. As you know, we met with you and members of your staff on April 16, 1986, to discuss our review comments on this report. It is our understanding that all the points of discussion have been resolved and the final report will reflect these changes.

Thank you for your efficient work, your attitude of cooperation, and your close coordination with us on these projects.

Sincerely yours,

John R. Woodworth

Regional Environmental Officer

United States Department of the Interior

BUREAU OF RECLAMATION
PACIFIC NORTHWEST REGION
FEDERAL BUILDING & U.S. COURTHOUSE
BOX 043 - 550 WEST FORT STREET
BOISE, IDAHO 83724

IN REPLY REFER TO: PN 150
565.

MAY 7 1986

Allyn Meuleman
Idaho Department of Fish and Game
600 South Walnut Street
P.O. Box 25
Boise, Idaho 83707

Dear Ms. Meuleman:

As you know, we furnished our comments to you on the Anderson Ranch, Black Canyon, and Boise Diversion Dam Report by letter dated March 31, 1986.

We have one additional item of concern which we feel should be brought to your attention. We have been unable to resolve to our satisfaction whether power generation was intended as a purpose for the Diversion Dam when it was conceived and built. It seems there is some possibility that the Diversion Dam was built solely for the purpose of irrigation diversion and that power generation was an afterthought.

Sincerely yours,

John R. Woodworth

Regional Environmental Officer

The SHOSHONE-BANNOCK TRIBES

FORT HALL INDIAN RESERVATION
PHONE (208) 238-3808
(208) 238-3867

TRIBAL FISH & GAME
P. O. BOX 306
FORT HALL, IDAHO 83203

April 24, 1986

APR 28 1986

G. Allyn Meuleman
Wildlife Biologist
Idaho Department of Fish & Game
600 South Walnut, Box 25
Boise, Idaho 83707

Dear Allyn:

I have reviewed your rough drafts for the Black Canyon, Boise Diverson, and Anderson Ranch Dam Wildlife and Wildlife Habitat Impact Assessment Reports. I am in agreement with your evaluation of the number of habitat units lost for each target species at all three projects.

Sincerely,

Dan M. Christopherson

Dan M. Christopherson
Tribal Wildlife Biologist

DMC/vsl

United States Department of Agriculture
Forest Service
Boise National Forest
1750 Front Street
Boise, ID 83702

Reply 2610

Date May 8, 1986

Mr. Jerry Conley, Director
Idaho Department of Fish and Game
PO Box 25
Boise, ID 83707

Dear Jerry:

Your final draft "Habitat Impact Assessment for Anderson Ranch, Black Canyon, and Boise Diversion Projects" resolves all Boise National Forest concerns. He were pleased to participate in the HEP field surveys conducted last summer around Deadwood and Anderson Ranch Reservoirs, and we are also very comfortable with the procedures used to evaluate preconstruction habitat conditions. Your assessment of losses attributable to hydroelectric development and operation at these reservoirs are appropriate.

We look forward to helping you identify high priority, cost-effective habitat improvement projects to mitigate these losses.

Sincerely,

JOHN J. LAVIN
Forest Supervisor

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Boise District
3948 Development Avenue
Boise, Idaho 83705

IN REPLY REFER TO 6520

APR 29 1986

G. Allyn Meuleman
Regional Wildlife Biologist
Idaho Department Fish and Game
Box 25
Boise, Idaho 83707

Dear Ms. Meuleman:

This letter is in response to your request for comments on the draft "Wildlife Impact Assessment - Anderson Ranch, Black Canyon, and Boise Diversion Projects, Idaho."

The document is well written and provides a comprehensive assessment of the losses sustained by wildlife from these projects. We believe the evaluation species chosen were logical representative species and the HEP evaluation method was appropriate to estimate habitat losses in definable habitat units. In spite of limited historic data, your descriptions of losses are based on sound rationale and represent reasonable values.

Thank you for the opportunity to comment on this document. The inclusion of our biologists on the evaluation team and the close coordination which resulted because of this involvement is appreciated. The draft report, as a result of this involvement, fully represents a product which we support.

Sincerely yours,

J. David Brunner
Associate District Manager

United States Department of the Interior

FISH AND WILDLIFE SERVICE

BOISE FIELD OFFICE
4696 Overland Road, Room 576
Boise, Idaho 83705

Kay 8, 1986

MAY 9 1986

MAY 15 1986

Jerry Conley, Director
Headquarters
Idaho Department of Fish and Game
Box 25
Boise, Idaho 83707

Dear Mr. Conley:

The Boise Field Office of the Fish and Wildlife Service has reviewed the draft report for Anderson Ranch, Black Canyon, and Boise Diversion Wildlife and Wildlife Habitat Impact Assessment.

During assessments, your technical staff met and coordinated with all the agencies involved and interested in the projects. We believe they did an in-depth evaluation using the available information and techniques. The wildlife and wildlife habitat losses they site in the report represent the best estimates for actual losses and should be used as the basis for determining mitigation goals.

Sincerely yours,

John P. Wolflin
Field Supervisor

PNUCC

PACIFIC NORTHWEST UTILITIES CONFERENCE COMMITTEE

April 28, 1986

Ms. G. Allyn Meuleman
Idaho Department of Fish and Game
600 S. Walnut, Box 25
Boise, Idaho 83707

Dear Ms. Meuleman:

This letter comprises the Pacific Northwest Utilities Conference Committee's comments on your draft Wildlife Impact Assessment on Anderson Ranch, Black Canyon, and Boise Diversion projects.

PNUCC has four major nontechnical concerns with the report. First, Anderson Ranch, Black Canyon, and Boise Diversion are multipurpose projects. PNUCC does not agree that 100 percent allocation of the losses to hydro is appropriate. We have recommended a project benefits allocation scheme based on congressional authorization to the Council. Second, we do not agree that any losses attributable to Deadwood Dam should be allocated to hydropower. The Deadwood facility is not a hydro project. Third, we believe that the tract of land historically leased by the Bureau of Reclamation to Idaho Department of Fish and Game for big game management and now under Forest Service management, plus those project lands directly turned over to the Forest Service should be taken into consideration as wildlife benefits at Anderson Ranch. Likewise, at Black Canyon, the wildlife benefits from the Montour Wildlife and Recreation Area should be taken into consideration. And fourth, PNUCC does not necessarily agree that a wildlife losses assessment at old, existing dams is appropriate or that a Habitat Evaluation Procedure (HEP) is an appropriate losses analysis for such projects.

In addition to the above, PNUCC has the following technical comments on the draft:

- The HEP analysis in this report appears to be generally adequate given the constraints and assumptions necessary for applying a HEP retroactively. The species models are adequately documented and appear to be appropriately selected and used. The published models are validated sufficiently. We assume that necessary considerations were taken to conform these models to local conditions. It would be appropriate to include an author reference on the unpublished models in the appendix.

- The field sampling scheme at Anderson Ranch is satisfactory. We assume that the level of field sampling was comparable at all three projects, although this is not clear in the reports on Black Canyon and Boise Diversion. The vegetation maps are probably reasonable for Anderson Ranch. However, the maps at Black Canyon and Boise Diversion are probably less accurate due to the poorer quality preconstruction information.

PNUCC 520 SW SIXTH AVENUE, SUITE 505 PORTLAND, OR 97204 (503) 223-9343

Deadwood Dam was authorized exclusively for the purpose of storing water for power generation at Black Canyon; the entire cost of the facility was to be repaid from power revenues (USBR 1949).

In the wildlife mitigation status report for the Anderson Ranch project, the lease of lands to the IDFG and the turning over of lands to the USFS were not considered to be wildlife mitigation (Chaney and Sather-Blair 1985a). The Montour area near Black Canyon also was not considered to be wildlife mitigation (Chaney and Sather-Blair 1985b).

Participating agencies and tribes (USBR, USBLM, USFS, USFWS, IDFG, Shoshone-Bannock Tribes) agreed that wildlife impact assessments and the Habitat Evaluation Procedures were appropriate for the projects.

As with the Anderson Ranch report, the level of field sampling for the Black Canyon and Boise Diversion evaluations is stated in the Methods sections.

- The underlying assumption that "the habitat quality of vegetation communities in or near the study area are representative of corresponding vegetation communities inundated by the project" seems to be an innovative effort to deal with the retroactive perspective of the HEP.

- One aspect of the analysis is unclear. The report states that many of the selected species are indicator species for specific habitats. The chickadee and warbler are probably examples. However, the Habitat Suitability Indices (HSI) appear to be summarized by species. As you are aware, it is desirable when evaluating habitat, rather than a particular species of interest, to summarize the HSIs by cover type. As a simplified example:

		Species					Habitat Totals
		Ruffed Grouse	Black-Capped Chickadee	Blue Grouse	Mule Deer		
		"Add" across species for habitat total					
Cover Types	Forested Wetlands	HSI	HSI		HSI		ΣHSI_h
	Evergreen Forest			HSI	HSI	**"Add" down cover types for species total**	ΣHSI_h
	Deciduous Shrub			HSI	HSI		ΣHSI_h
	Shrub-Steppe			HSI	HSI		ΣHSI_h
Species Total		ΣHSI_s	ΣHSI_s	ΣHSI_s	ΣHSI_s		

The rational is, as an example, that optimal habitat for "mule deer" and optimal "forested wetlands" are not biologically equivalent, although each are a component of the other. The report would be improved by a clearer statement of the objectives of the analysis (a measurement of species? of habitat?) and a presentation of the Habitat Suitability Indices, as well as the Habitat Units, to reflect these objectives.

Thank you for this opportunity to comment.

Sincerely,

Al Wright
Executive Director

KK:tq:167A

With the HEP, HSI's are never summed or summarized by cover type. For one species at a time, an HSI is estimated for one cover type at a time. By convention, an overall HSI is then calculated, one species at a time, by calculating a weighted mean (not a sum) over all the cover types in the study area used by the one species. Summarizing HSI's by cover type, by adding the HSI's for different species, would be a misuse of the HEP (USFWS 1980c, 1981).

As stated in the methods section of each report, the objective of the HEP analysis was to assess the impacts of each project on each evaluation species in terms of Habitat Units, a measure of quantity and quality of habitat.