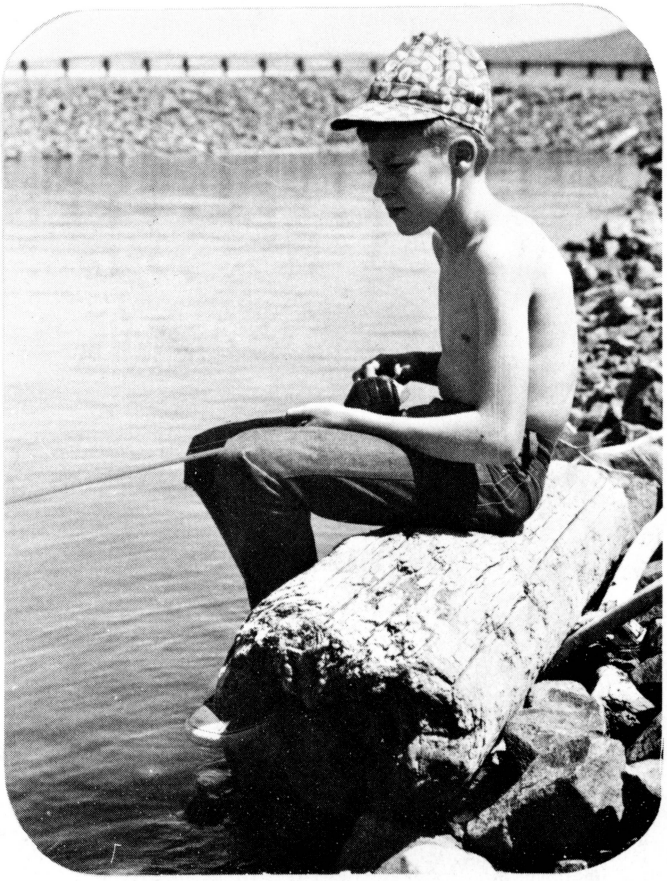
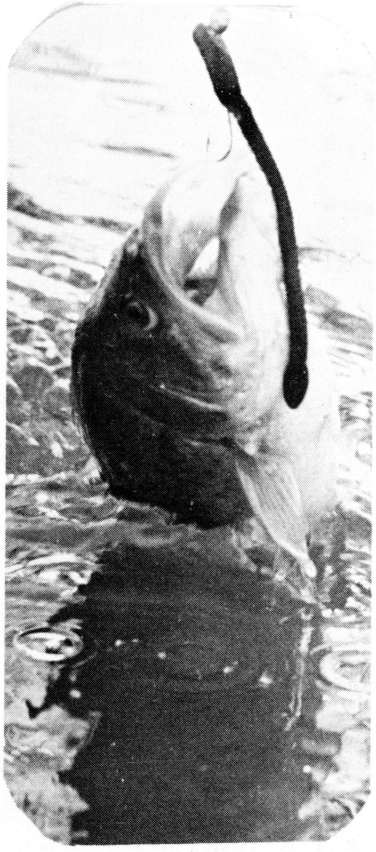
Final Environmental Impact Statement





Lower Snake River Fish and Wildlife Compensation

OFFICE OF THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY
WASHINGTON, D. C. 20314 September 1976

ENVIRONMENTAL IMPACT STATEMENT

LOWER SNAKE RIVER REPORT FOR
COMPENSATION FOR FISH AND WILDLIFE LOSSES

( ) Revised Draft (X) Final Environmental Statement

Responsible Office: District Engineer, U. S. Army Engineer District, Walla Walla, Walla Walla, Washington 99362 Telephone: 509-525-5500

1. Name of Action: ( ) Administrative (X) Legislative

2. Description of Action: The construction of the four multiple-purpose water resource development projects on the Lower Snake River created adverse impacts to fish and wildlife resources. Under the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended), an analysis of the impacts and possible compensative measures has been carried out. To compensate for fish and wildlife losses, the Corps recommends the construction of hatcheries for fall chinook salmon, spring and summer chinook salmon, steelhead trout, and possibly a trout hatchery. It also recommends the acquisition of streambank access on the Snake River or its tributaries for fishing, acquisition of easements for hunters, and the acquisition in fee of lands to be used for wildlife habitat improvement. The Corps also recommends wildlife habitat development of the existing Lower Snake River project lands, installation of bird-watering devices, and the stocking of game birds. The proposed action is the authorization and implementation of these recommendations. The total cost estimate is $45,735,267.

3.a. Environmental Impacts: The major impact will be to increase the populations of certain fish and wildlife in the region to offset those losses resulting from project construction.

b. Adverse Environmental Effects: Construction of hatcheries will require some disturbance to the existing landscape conditions at various sites to be selected. Increase in hunters and fishermen in the wildlife areas may result in an increase in problems such as littering, indiscriminate shooting, or trespass on adjacent lands. There may be some loss to the local tax base. There may be some adverse impact on agricultural production. There will be an impact on landowners who are required to sell their property unwillingly.

4. Alternatives: One alternative is to let the present situation continue without compensation. Another alternative, at least in concept, is the removal of the dams to eventually return the river canyon to a semblance of its former state. In addition, an alternative of implementing only a part of the recommended program also exists. There are also a number of differing and/or alternative compensation development or management variations which exist.

5.a. Comments on Draft Statement Received From:

Federal Agencies

U. S. Fish and Wildlife Service
Bureau of Land Management
Bureau of Reclamation
Bureau of Mines
Bureau of Indian Affairs
U. S. Environmental Protection Agency
Bureau of Outdoor Recreation
U. S. Coast Guard
Soil Conservation Service
Federal Power Commission
National Park Service
U. S. Department of Commerce
U. S. Geological Survey
Bonneville Power Administration

State Agencies

Washington State Agencies (Clearinghouse)
Idaho Department of Water Resources
Idaho Fish and Game Department
State of Oregon, Executive Department (Clearinghouse)

Local Agencies and Organizations

Columbia County Board of Commissioners
Whitman County Park and Recreation Board
Washington State Farm Bureau
ASWSU Environmental Task Force
Whitman County Sportsmen's Association, Inc.
Cheney Environment Center
Washington Public Utility Districts' Association

Private Citizens

Mr. Benton Dickinson, Pomeroy, Washington
Mr. Kennard L. Literal, Dayton, Washington
Mr. Joe Abbey, Waitsburg, Washington
Mr. and Mrs. Wilfred Thorn, Dayton, Washington
Mrs. Esther Eager, Dayton, Washington
Mr. Wesley L. Eager, Dayton, Washington
Mr. Morton R. Brigham, Lewiston, Idaho
Mr. Edward F. Naughton, Richland, Washington
Mr. Charles H. Thronson, Attorney for
Elmer DeRuwe and others, Dayton, Washington

5.b. Comments Requested on Revised Draft From:

Department of the Interior
Department of Agriculture
Department of Commerce
Department of Health, Education, and Welfare
Department of Transportation
Environmental Protection Agency
Federal Power Commission
State of Oregon
State of Washington
State of Idaho

5.c. Comments Received on Revised Draft From:

Pacific Northwest Regional Commission
Environmental Protection Agency
U. S. Coast Guard
Department of the Interior
Department of Commerce
Oregon Department of Fish and Wildlife
Department of Agriculture
Department of Health, Education, and Welfare
Federal Power Commission

6. Draft Statement to Council on Environmental Quality: 5 March 1975.

7. Revised Draft Statement to Council on Environmental Quality:
30 April 1976

8. Final Statement to Council on Environmental Quality:

GLOSSARY

Acre-foot	A unit of volume one acre in surface and one foot deep. One acre-foot equals 43,560 cubic feet.
Algal	Pertaining to or like algae, a group comprising seaweeds, pond scums, and other related plants.
Anadromous	Fish that hatch from eggs in fresh water streams, migrate to the ocean to grow to adulthood, and then return to their stream of origin to spawn.
Avian	Of or pertaining to birds.
Base Load	Continuous operation of generation units to meet a constant demand for electricity.
Benthic	Of or relating to the bottom of a body of water.
Biological	Of or relating to living things.
BOD	Biochemical oxygen demand: the amount of oxygen needed to support the oxygen-consuming organisms in a body of water. A high BOD may cause depletion of dissolved oxygen.
Cultural	Aspects of the advancement of human civilization, including traditions, and physical objects relative of the civilization, i.e., man-made objects.
Downstream Migrants	Young anadromous fish traveling to the sea. Also called juveniles, smolts, or fingerlings.
Ecosystem	A system composed of a community of animals, plants, and bacteria and the physical and chemical environment with which it is interrelated.
Embayments	Water bodies along the edges of the canyon extending into tributaries or side drainages.
Fetch	The expanse of open water which can be affected by the wind.

GLOSSARY (Continued)

Fluctuation	Changes in flow rates and water levels. In this report the river fluctuations (downstream) are due to daily and weekly changes in power production and turbine discharge rates or to spillway operation. Major reservoir fluctuations are on a seasonal basis due to annual water storage and release.
Forebay	The reservoir immediately upstream of a powerhouse, where the intakes of the turbines (penstocks) obtain water to operate the generator units.
Igneous	Relating to rock formed by heat, usually due to volcanic action.
Lentic	Slowly flowing (water); for instance, a reservoir.
Littoral (noun)	The shoreline between the high and low watermarks.
Littoral (adjective)	Of or related to the edge of a water body, extending downward to the limit of rooted vegetation.
Lower Snake River Project	The construction of four dam and lock projects consisting of Ice Harbor, Lower Monumental, Little Goose, and Lower Granite as authorized by Public Law 14, 79th Congress, First Session, approved 2 March 1945.
Mammalian	Of or relating to the class of mammals.
Mean Sea Level (msl)	The average level of the sea, used for altitude measurements. Sixteen hundred feet msl means 1,600 feet above the average level of the ocean.
Metamorphic	(Rock) formed by high pressures and temperatures over a long period of time, such as slate.

Natural	That which is or would be produced or present without human alteration.
Naturalistic	Simulating or approaching the results of nature.
Peaking	The practice of increasing flows through powerhouse turbines during hours of the day and week when power demands are high. The term "power peaking" is also commonly used.
Penstock	A gate for regulating the flow of water into the outlet system.
Releases	Discharges of water through a control structure or powerhouse. Daily release, annual release, and the like usually refer to averages for the respective periods.
Restoration	In reference to a damsite, alleviation of unnecessary intrusion and making the project blend harmoniously with the existing surroundings.
Riparian	Of or related to the bank of a watercourse.
Salmonid	Fish of the family Salmonidae, which includes salmon, trout, char, and whitefish.
Significant Wave	The average height of the highest one-third of all the waves on a body of water. Used to get an idea of the "average height of a high wave."
Slough	To slip, or cast off a layer or covering.
Socioeconomic	Of or relating to the structure of society and its economic activity.
Tailwater	The water immediately downstream of a dam or hydroelectric powerhouse.
Turbidity	Thickness or opaqueness of water due to suspended sediment.

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PREFACE

This final environmental impact statement is written at the survey stage of the planning process. It accompanies the special report that is sent for Congressional review.

Porcupine

I DESCRIPTION OF THE PROPOSED ACTION

INTRODUCTION

The proposed action is based on a report prepared by the Walla Walla District, Corps of Engineers, which was prepared taking full consideration of the recommended 1/ compensation measures reported by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service and concurred in by the state fish and game agencies of Idaho, Oregon, and Washington.

The action is the compensation (or mitigation) of fish and wildlife losses occasioned by the creation of the Lower Snake River project consisting of four locks and dams on the Lower Snake River, Washington and Idaho.

From the data presented in the Special Lower Snake River Compensation Report, and supported by the reports of the Federal fish and wildlife agencies and by letters from the counterpart state agencies, it has been concluded that serious losses have occurred to the fish and wildlife resources of the area through construction of the Lower Snake River Project. It is further concluded that these losses can be compensated for by implementation of a series of proposed actions. The Congressional authorization with subsequent funding and implementation of the following items, constitutes the proposed action.

SUMMARY OF COMPENSATION MEASURES

To compensate for fishery losses, the following features are proposed:

a. Hatchery and associated trapping and holding facilities to rear the progeny of 2,290 adult female fall chinook salmon, produce

1/ Two independent consultants, Dr. Ernest O. Salo and Dr. W. L. Pengally, generally concurred in the fish and wildlife recommendations. These consultants' views are contained in the Corps report.

101,800 pounds of smolts, and to be capable of returning 18,300 adults to the project area. These facilities would require approximately 40 acres of land to be acquired in fee. The estimated initial construction cost is $6,200,000 with annual operation and maintenance costs of $450,000.

b. Hatchery and associated trapping and holding facilities to rear the progeny of 2,145 adult female spring and summer chinook salmon, produce 450,000 pounds of smolts, and to be capable of returning 58,700 adults above the project. These facilities would require approximately 80 acres of land to be acquired in fee and have an estimated initial construction cost of $11,500,000 and annual operation and maintenance costs of $900,000.

c. Hatchery and associated trapping and holding facilities to rear the progeny of 3,390 adult female steelhead trout, produce 1,377,500 pounds of smolts, and to be capable of returning 55,100 adults above the project. These facilities would require approximately 80 acres of land to be acquired in fee. Estimated initial construction costs of $20,500,000 with annual operation and maintenance costs of $1,500,000.

d. Design and construction of these hatcheries would be funded through future appropriations to the Corps of Engineers. Operation and maintenance would be funded through future appropriations to the U.S. Fish and Wildlife Service or National Marine Fisheries Service. Prior to the actual design of the facilities, the level of hatchery compensation will be reviewed and possibly adjusted depending on the success of bypass, truck and haul, Dworshak hatchery returns, and any adverse effects of expanded powerhouses and increased peaking operations.

e. Hatchery facilities capable of producing 93,000 pounds of trout annually for stocking local streams to replace the lost sport-fishing opportunity or other alternatives of equal or lesser cost. The estimated construction cost of these hatchery facilties is $3 million, and annual operation and maintenance cost is $100,000. These facilities would require approximately 10 acres of land to be acquired in fee. The determination of the actual method of replacing the lost fishing opportunity will be determined by the Corps of Engineers in cooperation with the Washington Department of Game. Construction of the hatchery or other alternate measures will be funded through future appropriations to the Corps of Engineers. Operation and maintenance of the constructed facilities would be funded through future appropriations to the U.S. Fish and Wildlife Service.

f. The Corps of Engineers would, if appropriate, transfer title of the above hatchery and fish cultural facilities to the appropriate Federal or State fishery agency in a manner consistent with desires of the Administration and Congress under authority of the Fish and Wildlife Act of 1956 (16 USC 742) or by mutual agreement with the appropriate agency.

g. Acquisition of 750 acres of land along the Snake River and tributaries of streams adjacent to the lower or middle Snake River in

easement or fee to partially replace loss of stream-type steelhead and salmon sport fishery in the 150 river miles of the project area. Acquisition and development would be accomplished by the Corps of Engineers with ownership vested in the States. The Corps would acquire the land through normal Federal land acquisition procedures including condemnation if necessary. Lands would be purchased from willing sellers to the maximum extent possible consistent with full realization of compensation objectives. Based on the percent of project lands affected in each State, the acquisition would be allocated as 700 acres to the State of Washington and 50 acres to the State of Idaho. Estimated cost of acquisition is $750,000 with initial development cost of $300,000. Funding of land acquisition and development would be by future appropriation to the Corps of Engineers. Future development, if any, and operation and maintenance of these lands would be the responsibility of the State in which they are located.

2. Compensation of Wildlife Losses:

a. Acquisition of approximately 400 acres of riparian habitat in fee and 8,000 acres of farmland in easement surrounding these riparian lands to provide partial compensation for project-caused pheasant and quail hunting losses and additional hunting opportunity as a substitute compensation for nongame species. Acquisition of the land would be by the Corps of Engineers and would undertake the actual acquisition through normal Federal land acquisition procedures including condemnation if necessary. Lands would be purchased from willing sellers to the maximum extent possible consistent with full realization of compensation objectives. Costs for acquisition and initial development of these lands by the State would be reimbursed by the Corps of Engineers. Ownership of estates in the lands would be vested in the States. The initial cost of these lands is estimated at $2,100,000 for acquisition administrative overhead, and initial development. Annual operation and maintenance costs would be a State responsibility.

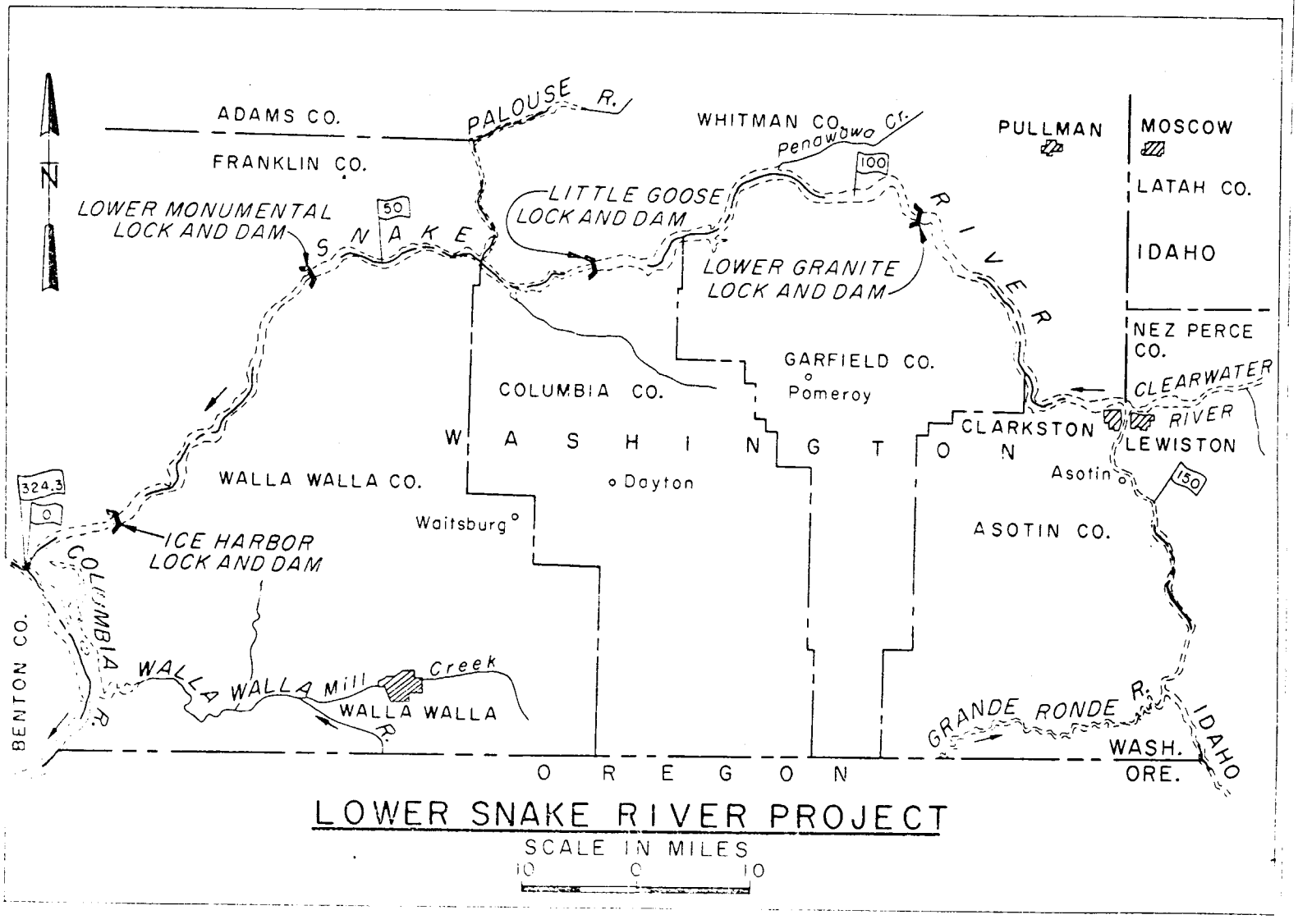
b. Acquisition of approixmately 15,000 acres of land in easement to provide hunter access as partial compensation for project-caused losses to chuckar-partridges. Acquire approximately 50 small select parcels of land (0.1 acre each) in easement or fee and construct bird-watering devices on these lands. The land would be located in the draws along the sides of the Snake River Canyon adjacent to the project area and would provide access to project lands from surrounding private lands. Access to these lands would be acquired by the Corps of Engineers through normal Federal land acquisition procedures including condemnation if necessary. Lands would be purchased from willing sellers to the maximum extent possible consistent with full realization of compensation objectives. The land would be managed by the Corps of Engineers in conjunction with adjacent project lands. Land access acquired by easement would be limited to the hunting seasons and would not be fenced so that normal

rangeland activities could be continued by the owners. Lands around the bird-watering devices would be fenced. Acquisition of these lands and construction of watering devices are estimated to cost $279,000 and the annual operation and maintenance cost $1,000.

c. The Corps of Engineers would enter into an agreement with the Washington Department of Game to provide game birds to stock project and acquired off-project lands for compensation of lost hunter-day use and animals caused by the project construction. The necessary stocking effort to fulfill compensation is estimated to be 20,000 birds per year for a 20-year period by which time habitat and a natural brood stock should be established. The agreement would provide for a lump-sum payment of $1,159,000, estimated capitalized value of the 20-year stocking period, to the Washington Department of Game to provide the birds either by out-right purchase, remodeling an existing bird farm, or constructing a new facility.

DISCUSSION

The Lower Snake River Project consisting of Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Locks and Dams, Snake River, Washington and Idaho, was authorized by Public Law 14, 79th Congress, 1st Session, approved 2 March 1945. The projects have been under construction over about a 15-year period. The reservoir at Ice Harbor (Lake Sacajawea) was formed in 1962; Lower Monumental Reservoir was created in 1969; Little Goose Reservoir (Lake Bryan) was filled in 1970; and Lower Granite was created in February 1975. A map showing the project area is on the next page.



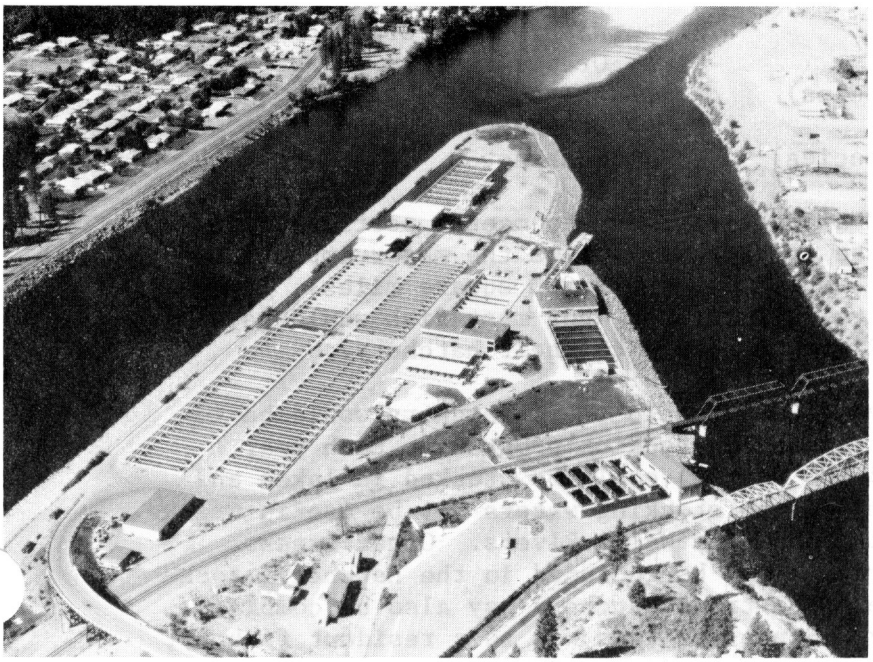
LOWER SNAKE RIVER PROJECT

SCALE IN MILES

10 0 10

The Fish and Wildlife Coordination Act (48 Stat. 401, as amended, 16 U.S.C. 661 et seq., which was approved 12 August 1958) requires[1/] an analysis of impacts on fish and wildlife, as well as compensation for the deleterious effects of dam construction and operation. The Fish and Wildlife Service, within the U.S. Department of the Interior, and the National Marine Fisheries Service, within the U.S. Department of Commerce, conducted the initial investigation, assisted by information from State agencies. To compensate for adverse impacts on the local fishery, the agencies recommended that fish hatcheries be constructed in the region. Such hatcheries would compensate for fish losses which resulted from the elimination of spawning areas and from dam-produced mortalities to migrating smolts in the Lower Snake River.

1/ Section 662 (b): "In furtherance of such purposes, the reports and recommendations of the Secretary of the Interior on the wildlife aspects of such projects, and any report of the head of the State agency exercising administration over the wildlife resources of the State, based on surveys and investigations conducted by the United States Fish and Wildlife Service and such State agency for the purpose of determining the possible damage to wildlife resources and for the purpose of determining means and measures that should be adopted to prevent the loss of or damage to such wildlife resources, as well as to provide concurrently for the development and improvement of such resources, shall be made an integral part of any report prepared or submitted by any agency of the Federal Government responsible for engineering surveys and construction of such projects when such reports are presented to the Congress or to any agency or person having the authority or the power, by administrative action or otherwise, (1) to authorize the construction of water-resource development projects or (2) to approve a report on the modification or supplementation of plans for previously authorized projects, to which sections 661-666c of this title apply. Recommendations of the Secretary of the Interior shall be as specific as is practicable with respect to features recommended for wildlife conservation and development, lands to be utilized or acquired for such purposes, the results expected, and shall describe the damage to wildlife attributable to the project and the measures proposed for mitigating or compensating for these damages. The reporting officers in project reports of the Federal agencies shall give full consideration of the report and recommendations of the Secretary of the Interior and to any report of the State agency on the wildlife aspects of such projects, and the project plan shall include such justifiable means and measures for wildlife purposes as the reporting agency finds should be adopted to obtain maximum overall project benefits."



Dworshak National
Fish Hatchery

Hatchery sites and designs have not yet been determined. Detailed studies and design would not be undertaken until after the compensation program is acted on by Congress. There would be variations in the facilities proposed for each hatchery, depending on location. When hatchery designs are completed, it would be possible to present more exacting descriptions of hatchery facilities. 1/

The Columbia Basin Fishery Technical Committee (CBFTC) has recently finished recommendations for possible hatchery sites. (See Appendix I.) The Fish and Wildlife Service, as well as the National Marine Fisheries Service, indicated that five fish races of two species (fall, spring, and summer chinook of one species as well as steelhead and rainbow trout of the other species) would be provided with hatchery facilities to compensate for fish losses. The new hatcheries would be located near streams found in the Snake River area. Some possible streams which could support a hatchery are:

1/ Supplemental environmental impact statements would be prepared later for the individual hatcheries.

River	State
Clearwater	Idaho
Tucannon	Washington
Middle Snake	Idaho, Washington, Oregon
Salmon	Idaho
Columbia	Washington, Oregon
Potlatch	Idaho
Grande Ronde	Washington, Oregon
Imnaha	Oregon
Powder (resident species)	Oregon
Walla Walla	Washington, Oregon
Palouse (resident species)	Washington

Existing hatcheries could also be expanded to meet a portion of the needed productivity. Plate 1 (page 2-2) shows the major impact area covered in this statement, which is over 2,000 square miles. Hatcheries could be located outside this area, but most fish would pass through the lower Snake River to return to their hatchery.

The primary objective of a possible trout hatchery would be to provide rainbow trout for expanded stocking programs. Each year 233,000 rainbow trout (93,000 pounds) could be stocked in lakes and streams in the area. Some of the stocking waters may be Asotin Creek and the Tucannon, Touchet, and Walla Walla Rivers. Other creeks, lakes, or ponds in the project may be included in the hatchery stocking program in the future. The trout hatchery may also be combined with a steelhead hatchery. Since the loss was to a resident fishery, principally warm-water species, a study would be made to determine if feasible means exist to replace the fishery in kind in the project area. This study should be conducted prior to a final commitment to substitute that fishery by supplemental stream stocking of trout.

The steelhead hatcheries would raise 11,020,000 smolt, the offspring from 3,390 adult female steelhead. Salmon hatcheries would raise 9,160,000 smolt, the offspring of 2,290 adult female fall chinook salmon, and 6,750,000 smolt, the offspring of 2,145 adult female spring and summer chinook salmon.

A major component of the proposed compensation plan revolves around acquisition of easements and fee title on certain lands which either are or could be of values to fish, wildlife, or recreation resources. These real estate actions would be taken in a coordinated fashion which would see hunting or fishing easements acquired surrounding areas where intensive upland bird habitat is developed or along streams where fish stocking is accomplished. In this manner, optimum use of the compensation resource would be achieved.

Land acquisition for fishery compensation would be oriented toward replacing lost opportunities for stream fishing. It would consist of acquiring fisherman access easements or fee title to approximately 750 acres of streambanks in the general southeastern Washington, and western Idaho areas. A partial listing of streams which could be included in the program are the Tucannon, Middle Snake, Grande Ronde, and Clearwater Rivers, plus other streams which would meet necessary requirements. Much of this easement acquisition primarily would be oriented toward replacing steelhead fishing opportunities which have been lost as a result of construction of the Lower Snake River Project; however, these same easements would also provide access to resident fishery populations, some of which are native and others which would be supported by proposed compensation stocking programs.

The method of fishery easement or fee acquisition would be for the Corps to acquire the access through normal Federal land acquisition procedures including condemnation if necessary. Lands would be purchased from willing sellers to the maximum extent possible consistent with full realization of compensation objectives. Some of these funds would be used for actual access acquisition and some would be used to provide minimal facilities (small parking areas, restroom facilities, litter barrels, etc.) at some of the access sites.

Land acquisition for wildlife compensation would be accomplished primarily through acquiring hunter access on private land. A minimal amount of fee title acquisition is also envisioned in the program. In the proposed program there is a direct relationship between the easement lands, fee title lands, and project lands. Relations of the wildlife compensation land acquisition program are:

a. Development of wildlife habitat on existing project lands, (see Appendix G).

b. Acquisition of easements on rangeland and selected draws adjacent to project land. Watering devices would be installed on these adjacent lands which would tend to complement habitat development on project lands.

c. Acquisition of fee title to "off-project" lands in one or more parcels which presently have high value for upland birds or have development potential. This land would be located in the southeastern Washington area. This land would be developed through food and cover habitat planting to increase its capacity to support wildlife. Acquisition of hunter easements for use during the hunting season on private land surrounding the land acquired in fee title would allow maximum hunter use of the habitat resources.

The intent of the land acquisition program is basically two-fold.

a. To provide a land base which can be managed for wildlife production, and

b. To provide replacement areas where it would be possible for hunters and non-consumptive users of wildlife to pursue their interests.

Acquisition of both fee title land and easement lands serve these purposes. By acquiring easement lands surrounding areas of intensive wildlife habitat development, the easement lands would benefit from the wildlife production that can occur on the "core" areas. At the same time it is not necessary to alter the existing activities on the easement lands and yet wildlife would still benefit.

Implicit in the land acquisition program is the requirement for development of these lands so they would be able to support wildlife populations. Most habitat development would occur on project lands 1/ or on lands which are acquired in fee. It may be possible that habitat development can be done on some of the easement areas if a suitable agreement can be worked out with the involved landowners; however, present land use patterns on the easement lands would not otherwise be altered.

COST ESTIMATE AND ANTICIPATED BENEFITS

The total estimated cost of the fish and wildlife compensation program as proposed is $5,922,195 annually. The estimated cost of the various subfeatures of the program are given in the project document which is available for review at the District Office. A summary extracted from that report is included as Table 1. Estimated economic benefits resulting from the total program amount to $11,885,815. This results in a benefit to cost ratio of 2.01:1.

1/ Habitat improvement for wildlife on the existing Lower Snake River Project lands will proceed independent of the balance of the actions described.

TABLE 1

SUMMARY OF FACILITIES AND COSTS OF WILDLIFE COMPENSATION FACILITIES
LOWER SNAKE RIVER PROJECT

Facility	Land Requirements	Cost 1/ Initial Cost	Annual O&M
Fish			
Fall Chinook Hatchery	40 Acres	$ 6,200,000	$ 450,000
Spring and Summer Chinook Hatchery	80 Acres	11,500,000	900,000
Steelhead Trout Hatchery	80 Acres	20,500,000	1,500,000
Rainbow Trout Hatchery	10 Acres	3,000,000	100,000
Fisherman Access Lands and Development	750 Acres	1,050,000	
Total		$42,250,000	$2,950,000
Wildlife			
Acquistion and Development of Off-Project Lands	23,400 Acres 2/	$ 2,379,000	$ 1,000
Game Bird Purchase		$ 1,159,000	
Total		$ 3,538,000	$ 1,000
TOTAL COST		$45,788,000	$2,951,000

1/ Includes initial development of lands.
2/ Includes 23,000 acres in easement and 400 acres in fee.

II ENVIRONMENTAL SETTING

The Snake River Basin is one of the most important fish producing systems in the United States. It supports large populations of anadromous and resident fish. Anadromous fish from the Snake River, particularly chinook salmon, contribute substantially to commercial and sport fisheries in the Pacific Ocean from California to Alaska. Steelhead trout support a huge sport fishery throughout the lower Columbia and Snake River and its tributaries. Most of the adult chinook salmon and steelhead trout that migrate upstream in Columbia River past McNary Dam enter Snake River. The sport fishery for anadromous, as well as resident species has developed substantially in the lower Snake River within the past decade.

The environmental consideration of the lower Snake River fish and wildlife compensation program involves a wide range of effects which may be regional in nature. Even though the project directly affects events along the lower Snake River canyon in the 140-mile reach from Ice Harbor Dam to Lewiston, the compensation opportunities and requirements indicate that a much larger portion of the region would be influenced by sitings of hatcheries and habitat lands. On this basis then, the discussion of the environmental setting which follows addresses the overall characteristics of the extensive region indicated by the plate on page 2-2.

THE REGION

The region involved is comprised of the southeastern portion of Washington, the northeastern portion of Oregon, and the central part of Idaho. This is basically that portion of the Snake River drainage (including tributaries) which supports anadromous fish. Several other areas in Washington which are not tributary to the Snake River may be considered as part of the region as they may be affected by upland game habitat land programs. The counties of the region are:

Washington	Oregon	Idaho
Walla Walla	Umatilla	Nez Perce
Columbia	Union	Latah
Garfield	Wallowa	Lewis
Asotin	Baker	Idaho
Franklin		Clearwater
Whitman		
Adams		

Plate 1 Project Area

Due to the conceptual nature of the proposed compensation plan, it is not possible to provide a precise description of the lands that will be acquired for compensation purposes. In a general way the characteristics of desirable land parcels are known, and these form the basis for the following discussion.

a. Land Acquisition for Fishery Compensation. The easements to 750 acres of streambanks would be located along perennial streams that provide habitat for fish on a year-round basis. Because loss of the Snake River steelhead fishery is a major adverse impact of the Lower Snake River Project, a preference for streams which currently support a run of steelhead trout (e.g., Middle Snake, Grande Ronde, Clearwater) would be shown. Ready public access via public roads would be a consideration in choosing areas for easement acquisition. Most of the suitable streams have substantial riparian vegetation surrounding them and provide pleasant relief to the generally dry agricultural land. At the present time some of the streams in the area are heavily posted against public access.

b. Land Acquisition for Wildlife Compensation. The 400 acres to be acquired in fee would be lands having some existing wildlife value or potential for wildlife use. This would necessitate acquiring areas with very good soil. Such areas may be in agricultural production. A good source of water, i.e., a well or perennial stream, would be a desirable feature. Because there are so many areas which would fit the general description contained here, many possible locations exist for land acquisition. Consideration must be given to the capability of securing hunter easements on private land surrounding the acquired parcels because it is an integral part of the planned upland game compensation proposal. The factor would weigh heavily in the final selection of lands to be acquired by fee title.

Concerning the proposed easement lands surrounding the fee title lands, only a brief general description is available. Initial estimates show that these lands would likely be farmlands (as opposed to rangelands); however, it may be possible, in some instances, to provide limited habitat development on parts of this land that would not interfere with its primary use, agricultural production. Hopefully, it will be possible to locate the proposed 400 acres of fee title land in an area which is surrounded by land with inherent wildlife values that will make this segment of hunter easement acquisition a more meaningful compensation tool.

More is known about the general nature of the proposed 15,000 acres of hunter easement lands because this land should be adjacent to lands purchased directly for the Lower Snake River Project. In general, the easements would be acquired on rangeland which extends from the project boundary to the upper breaks of the Snake River canyon. The most desirable areas for easement acquisition would be located in and adjacent to major side canyons. These side canyons are heavily vegetated and are known to support good populations of

wildlife species. Side canyons whose upper ends are in close proximity to public roads would be especially valuable as an easement. The primary use of these rangeland areas is seasonal cattle grazing. The acquisition of hunter easements would not be in conflict with this primary use. Inasmuch as these side canyons support substantial populations of upland game birds (primarily chukar partridge with some quail and pheasant) and some deer, acquisition of side canyon easements could do much to replace lost hunting opportunities.

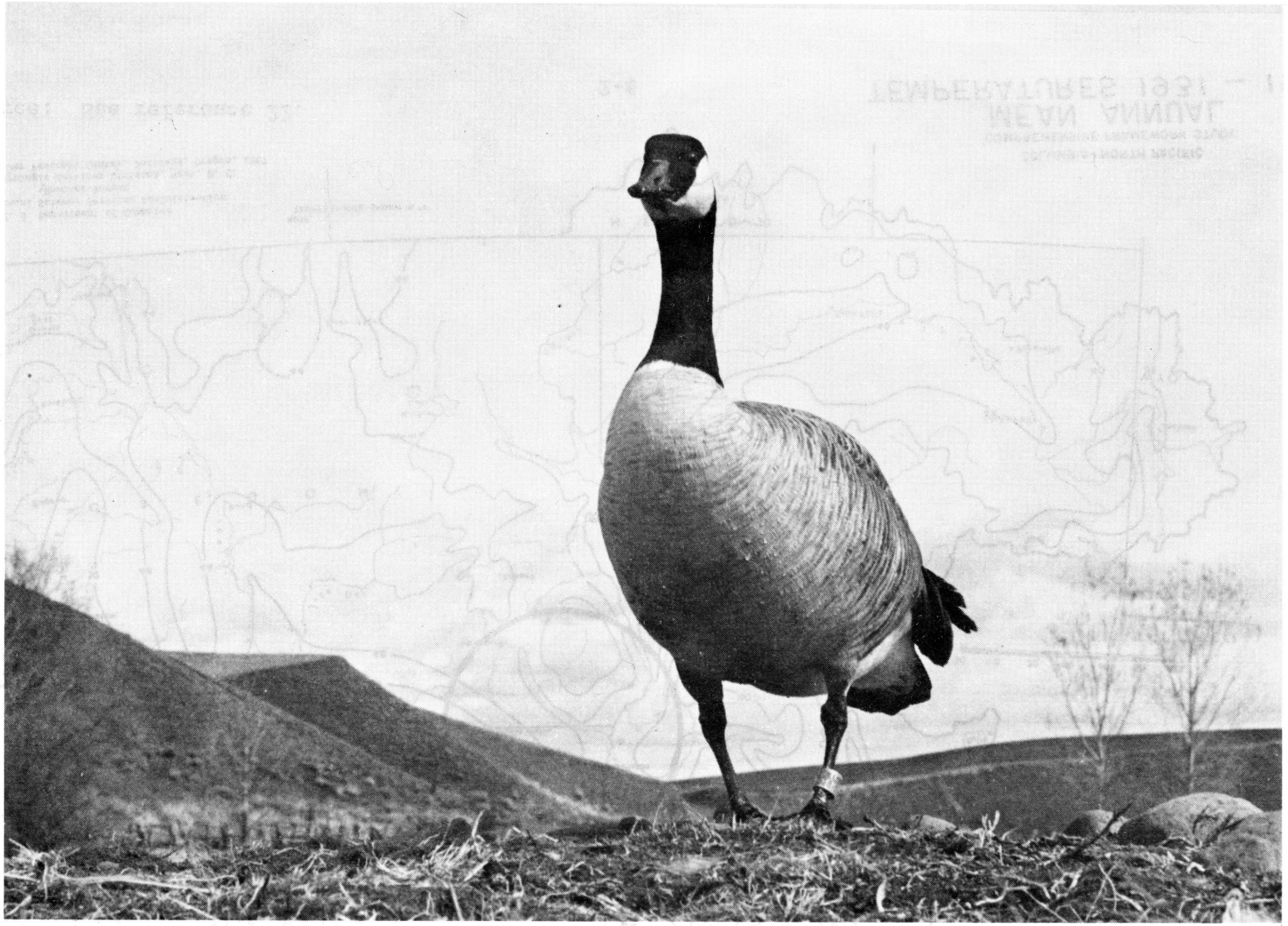
1. Climate

The climate of the area is predominantly dry, but some of the characteristics of both continental and marine situations are evident. The Selkirk and Rocky Mountains effectively protect the large inland basin of southeastern Washington and northeastern Oregon from the more severe winter storms that move southward from Canada. To the west the Cascade Mountains are an effective barrier to moist air moving eastward from the Pacific Ocean. Air from each of these sources, however, reaches the area.

The project area is characterized by wide seasonal variations in temperature and wide geographical variations in precipitation. Average monthly temperatures at Walla Walla range from 32.0 degrees* in January to 76.2 degrees in July, and extremes of recorded temperatures range from -16 degrees to 113 degrees. Plate 2 shows the mean annual temperature for the region. Mean annual precipitation for stations keeping records ranges from 15.07 inches at Walla Walla in the lower portion of the Mill Creek Basin to 40.6 inches 15 miles upstream at the Walla Walla city water intake, approximately 2,400 feet. It is probable that at elevations near 5,000 feet mean annual precipitation exceeds 50 inches. At Walla Walla, approximately 10 percent of the normal annual precipitation falls as snow; at higher elevations this percentage is increased considerably, becoming approximately 40 percent at the 5,000-foot level. Plate 3 shows the region's normal annual precipitation. The higher elevations show a much higher rainfall in the Bitterroot Mountains east of the Snake River in Idaho. Snowfall constitutes a major portion of the mountains' precipitation.

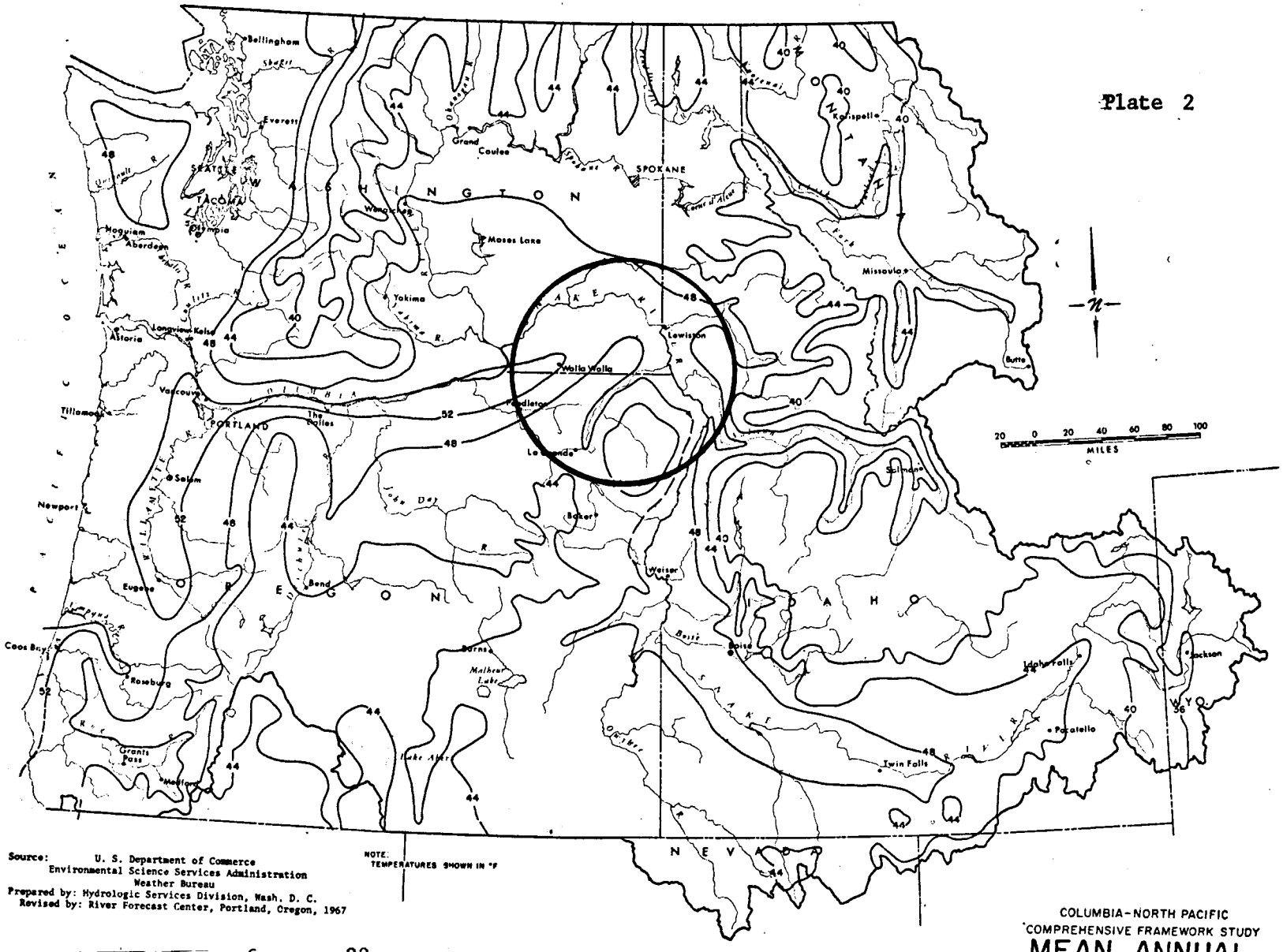
The project area is in the belt of prevailing westerlies and is largely under the influence of air from the Pacific Ocean. Occasionally polar outbreaks of cold air spill over the Rocky Mountain barrier, resulting in short periods of extremely low temperatures. At Walla Walla the average frost-free period extends from late March through early November; the average growing season is considered to be 220 days.

* All temperature measurements are recorded as Fahrenheit degrees.



The familiar V-shaped flight pattern of Canada Geese marks an upcoming seasonal change across this country. This banded goose is a western variety, Branta canadensis moffitti.

Plate 2



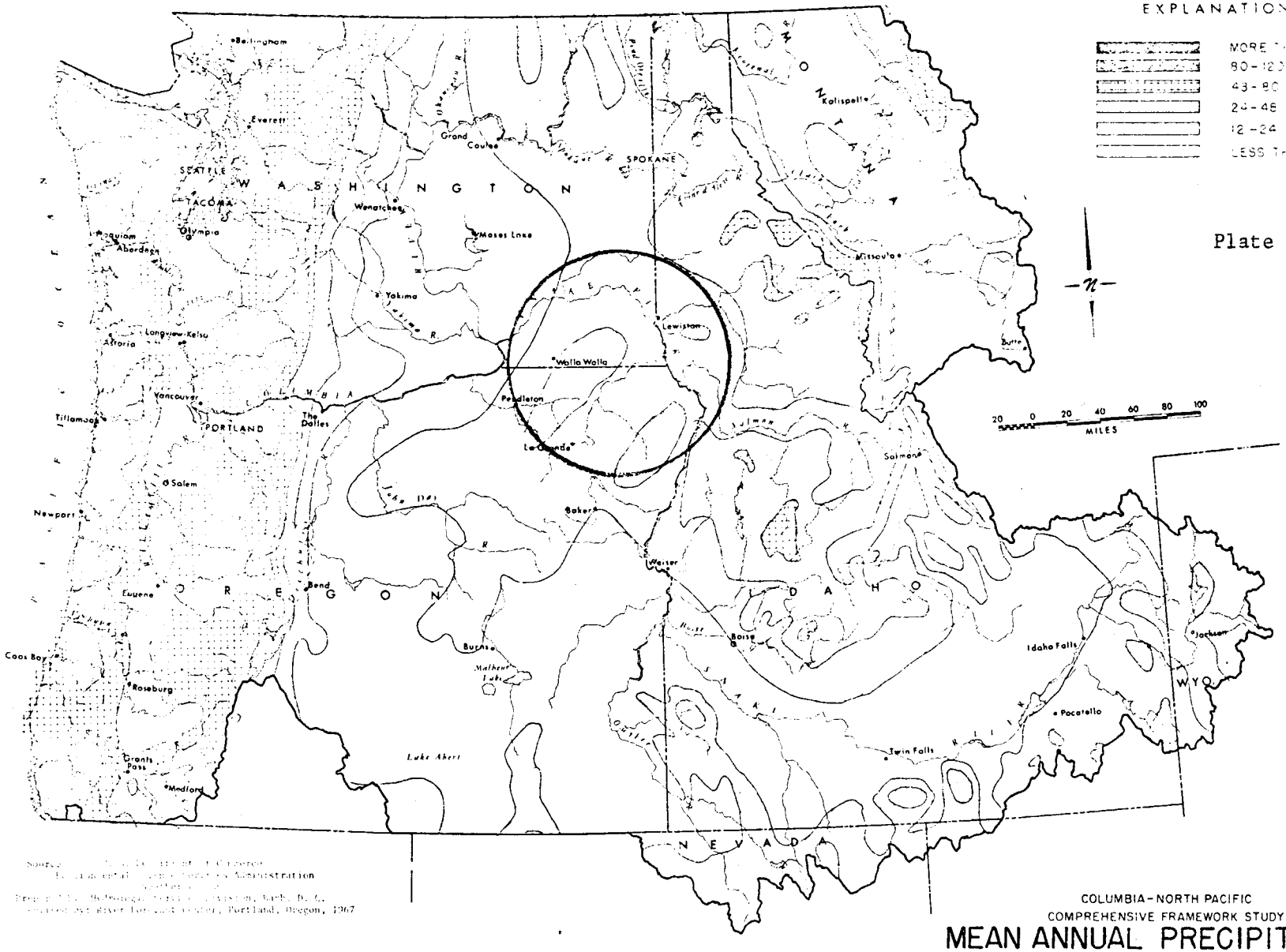
Source: U. S. Department of Commerce
Environmental Science Services Administration
Weather Bureau
Prepared by: Hydrologic Services Division, Wash. D. C.
Revised by: River Forecast Center, Portland, Oregon, 1967

NOTE: TEMPERATURES SHOWN IN °F

COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

MEAN ANNUAL TEMPERATURES 1931 – 1951

Source: See reference 22.



Source: See reference 22.

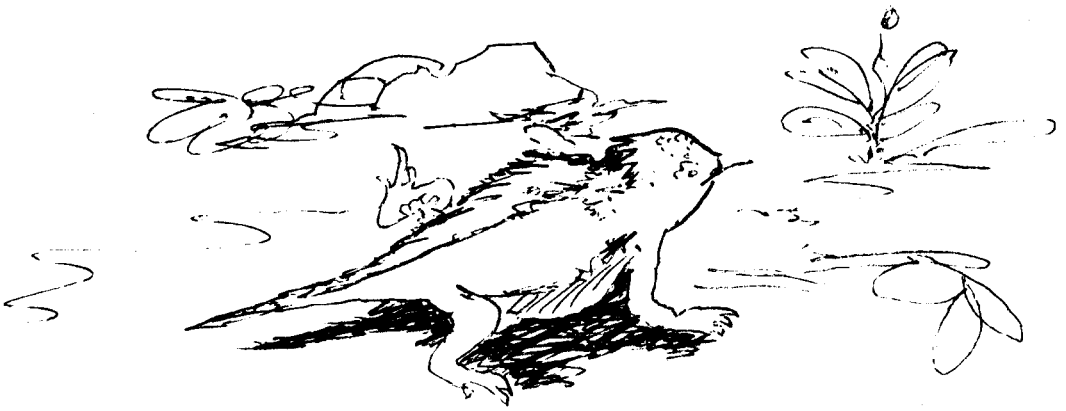
COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

MEAN ANNUAL PRECIPITATION IN INCHES THE REGION

1968

The project area and the bordering mountains normally have such low rainfall during the summer months that drought conditions are typical of the climate. Although summer convectional storms may locally reduce drought frequency during the growing season, drought periods of at least a month's duration occur every year. Two-month droughts occur about every other year, three-month droughts about three years in ten, and droughts of four months or longer duration occur about two years in ten.

Variation in total annual precipitation, entirely apart from seasonal drought occurrence, also affects water supplies. Dry years with less than two-thirds of normal precipitation occur about once in five years for most of the project area.



2. Air Quality

Within the project area there are nine air quality sampling stations. The majority of these stations measure only total suspended particulates. However, suspended particulates appear to be the only quality parameter of widespread concern. At some stations suspended particulates exceed established Federal and State standards. The State of Washington has an Air Quality Standard which is more restrictive than the Federal standard. Table 2 shows the Federal and Washington State Standards. Monitoring stations usually measure samples as a geometric mean of the micrograms per cubic meter (ug/m3).

Overall air quality in the project area is good. The only parameter of air quality which does not satisfy the Federal primary standards is suspended particulates. However, a reason for high readings may result from dryland or irrigated farmland surrounding the sampling stations. Plowed fields are susceptible

POLLUTANT	MEASUREMENT CLASSIFICATION	NATIONAL AMBIENT AIR QUALITY STANDARDS						DEPARTMENT OF ECOLOGY AMBIENT AIR QUALITY REGULATIONS					
		PRIMARY STANDARDS			SECONDARY STANDARDS			AIR QUALITY STANDARD			AIR QUALITY OBJECTIVE		
		($\mu g/m^3$)*	(ppm)**	(mg/m^3)***	($\mu g/m^3$)*	(ppm)**	(mg/m^3)***	($\mu g/m^3$)*	(ppm)**	(mg/m^3)***	($\mu g/m^3$)*	(ppm)**	(mg/m^3)***
Suspended particulates	Annual geometric mean	75	-	-	60	-	-	60	-	-	-	-	-
	Maximum 24-hour average (1/yr)	260	-	-	150	-	-	150	-	-	-	-	-
	Annual median	-	-	-	-	-	-	-	-	-	30	-	-
Sulfur oxides measured as SO_2	Annual arithmetic mean	80	0.03	-	60	0.02	-	60	0.02	-	-	-	-
	Maximum 24-hour average (1/yr)	365	0.14	-	260	0.10	-	260	0.10	-	-	-	-
	Maximum 3-hour average (1/yr)	-	-	-	1300	0.50	-	-	-	-	-	-	-
	Maximum 1-hour concentration	-	-	-	-	-	-	1043	0.40	-	-	-	-
	Maximum 1-hour average (2/7days)	-	-	-	-	-	-	655	0.25	-	-	-	-
	Maximum 5-minute average	-	-	-	-	-	-	-	-	-	786	0.3	-
Carbon monoxide (CO)	Maximum 8-hour average (1/yr)	-	9	10	-	9	10	-	9	10	-	-	-
	Maximum 1-hour average (1/yr)	-	35	40	-	35	40	-	35	40	-	-	-
	Maximum 24-hour average	-	-	-	-	-	-	-	-	-	6	5	-
Photochemical oxidants	Maximum 1-hour average (1/yr)	160	0.08	-	160	0.08	-	160	0.08	-	-	-	-
Hydrocarbons (Less Methane)	Maximum 3-hour average (6-9am,1/yr)	160	0.24	-	160	0.24	-	160	0.24	-	-	-	-
Nitrogen dioxide (NO_2)	Annual arithetic mean	100	0.05	-	100	0.05	-	100	0.05	-	-	-	-

*micrograms per cubic meter
**parts per million
***milligrams per cubic meter

Note: Department of Ecology Standards for Photochemical Oxidants and Hydrocarbons refer to the time period April 1 through October 31, between the hours 1000-1600 PST.

Source: See reference 5.

Table 2

to wind erosion, and the dust created by high wind is probably responsible for the high suspended particulate measurements. Wind erosion's contribution may be so great that Federal primary standards in some areas are not maintainable, even in a natural state.

Population densities are very low within the project area and should not create serious air pollution problems. Cattle and grain are the primary products of Eastern Washington and Oregon. Timber products are dispersed in Washington and Oregon while constituting a major role in the economy of the Idaho section of the project area. These products do not create dense communities. The following listing shows the population density (people per square mile) of major counties within the project area.

Idaho	ppsm	Oregon	ppsm	Washington	ppsm
Adams	2	Baker	5	Asotin	22
Clearwater	4	Umatilla	14	Columbia	5
Idaho	2	Union	10	Garfield	4
Latah	23	Wallowa	2	Walla Walla	33
Lewis	8			Whitman	18
Nez Perce	36				

The average population density is approximately 13 people per square mile for the above counties combined.

The following tabulation displays the basic air quality data of the region:

SITE	ANNUAL AVERAGE			MAXIMUM
State Standard	(60 ug/m3)			(150 ug/m3)
Federal Standard	(75 ug/m3)			(260 ug/m3)
Washington				
Walla Walla	56	ug/m3	(1972)	587 ug/m3
	46	"	(1973)	
Clarkston	108	"	(1971)	269 ug/m3
	95	"	(1972)	
	80	"	(1973) 1/	
Idaho 2/				
Lewiston	119	"	(1972)	
(three stations)	100	"	(1972)	
	85	"	(1972)	
Moscow	67	"	(1972) 3/	
Oregon				
LaGrande	47	"	4/	180 ug/m3
Baker	73	"	4/	286 ug/m3
Pendleton	82	"	4/	504 ug/m3

1/ The record contained only a six month sample in 1973.
2/ Lewiston and Moscow conducted some gross samplings for sulfur dioxide with no violations detected.
3/ The record contained only 17 samples in 1972.
4/ The record contained data from January 1970 until March 1974.

Table 3

3. Geology and Physiography

Straddling the Washington-Oregon line, the Columbia Plateau is the central province east of the Cascades. From elevations of nearly 4,000 feet around the edges, the plateau slopes gently down to about 350 feet along the gorges of the Columbia and lower Snake Rivers. At a distance the plateau appears flat to gently rolling, but it is dissected by present-day streams and in the northern part by deep, vertical-walled couless which were formed as temporary flood-water channels during the time the course of the Columbia River was blocked by an ice sheet. Many small rivers drain the area which extends south from the upper curve of the Columbia to the Blue Mountains, west to the foothills of the Cascades, and east above the Snake just east of the Washington-Idaho line.

Throughout most of the Columbia Plateau the volcanic rocks are overlain by varying thicknesses of surface materials. Almost everywhere upland surfaces are mantled with a few to more than 100 feet of loess or windblown sand. North of the Columbia River glacial outwash, sand and gravel and lacustrine silt fill basins and channels in the basalt. Soils on the outwash range from sandy loams to silt loams and generally are gravelly in the profile. Soils on lake beds are compacted stratified silts. The loess and other windblown deposits range from sand to silt loams. These soils are deep and fertile, and are easily eroded.

The Columbia River Group, the glacial outwash, and the younger alluvium along present streams yield large quantities of water at many places. The alluvium, glacial outwash, and windblown deposits have a high porosity and store large volumes of water where saturated. However, in many places those deposits are above the water table, which is in the underlying basalt having low average porosity. Much of the area is semi-arid to arid. Annual recharge probably does not exceed 3 inches, and in some places may be equivalent to less than 1 inch of water over the area.

In the western and southern parts of the Columbia Plateau, most of the discharge of streams is generated in the Cascade Range and the Blue and Ochoco Mountains. A considerable part of the eastern Columbia Plateau has little or no external drainage.

To the southeast of the Columbia Plateau lie the Blue Mountains, extending from extreme southeastern Washington to central Oregon. Peaks in the Blue Mountains and associated ranges rise from 7,000 to 9,000 feet; but in the separate outlying Wallowa Range on the east they rise to more than 10,000 feet. This area is drained by the John Day and Crooked Rivers flowing west and north, by the Umatilla and Walla Walla Rivers flowing west to the Columbia, and by the Grande Ronde, Malheur, and other smaller tributary streams of the Snake River. Plate 4 displays the major drainage system of the region.

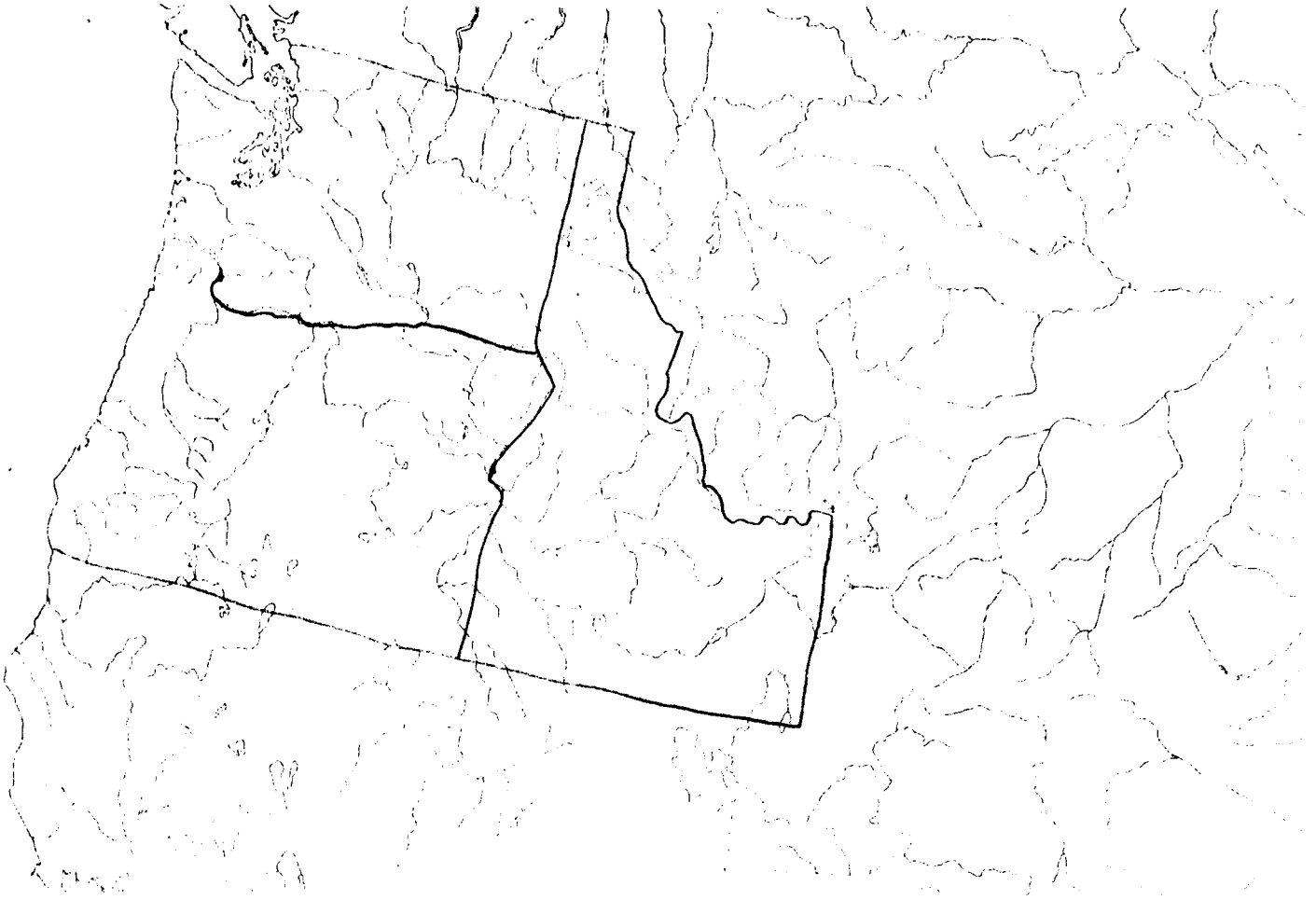


Plate 4 Major Drainage Systems

Source: See referehce 15.

4. Water Quality

Recently the Columbia Basin Fisheries Technical Committee's Lower Snake Hatchery Subcommittee presented their preliminary hatchery site recommendations to the Corps. Appendix I contains the preliminary hatchery site recommendations. The Corps would conduct water quality studies at those selected locations and/or others which may be considered during detailed siting investigations. On the whole, the streams of the region have relatively good water quality, with good opportunity for developing suitable fish hatchery supplies.

5. Vegetation

The Columbia Basin region has several vegetation zones. The drier upland areas are considered big sagebrush-wheatgrass (Artemisia tridentata - Agropyron sp.) and wheatgrass-bluegrass (Agropyron sp. - Poa sp.) associations. Wheatgrass is the dominant grass in both dry and moist soils of the area. A listing of the regional vegetation is located in Appendix B. Not all of the plants listed in Appendix B should be found in any one vicinity. Those plants most likely to be found near lowland streambanks are as follows:

Trees and Shrubs

Douglas maple (mountain)	Acer glabrum
Silver maple	Acer saccharinum
Sagebrush	Artemisia ludoviciana
Netleaf Hackberry	Celtis reticulata (douglasii)
Rubber rabbitbrush	Chrysothamus nauseosus
Black Hawthorn	Crataegus douglasii
Black Walnut	Juglans nagens
Lombardy poplar	Populus nigra
Black Cottonwood	Populus trichocarpa
Chokecherry	Prunus virginiana
Smooth Sumac	Rhus glabra
Black Locust	Robinia pseudoacacia
Wild Rose	Rosa woodsii
Willows	Salix sp.
Blue Elderberry	Sambucus glauca

Perennial Grasses

Crested Wheatgrass	Agropyron cristatum
Basin wildrye	Elymus cinereus
Idaho fescue	Festuca idahoensis
Sandberg bluegrass	Poa secunda

Annual Grasses

Cheatgrass	Bromus tectorum
Bromegrass	Bromus sterilis
Yellow foxtail	Setaria glauca

Perennial Forbs

Plains Prickly pear	Opuntia polyacantha
Yellow dock	Rumex crispus
Elegant goldenrod	Solidage lepida

Biennial Forbs

Flannel Mullein	Verbascum Thapsus

Annual Forbs

Clasping pepperweed	Lepidium perfoliatum
Russian thistle	Salsola pestifer
Cocklebur	Xanthium strumarium

The region contains 315 species of plants. Many plants are restricted to the riparian zone where water is abundant.

There are usually three vegetational zones in the Columbia Basin riparian area. Plate 5 displays the zonation pattern. This pattern is the one representative of lower altitudes.

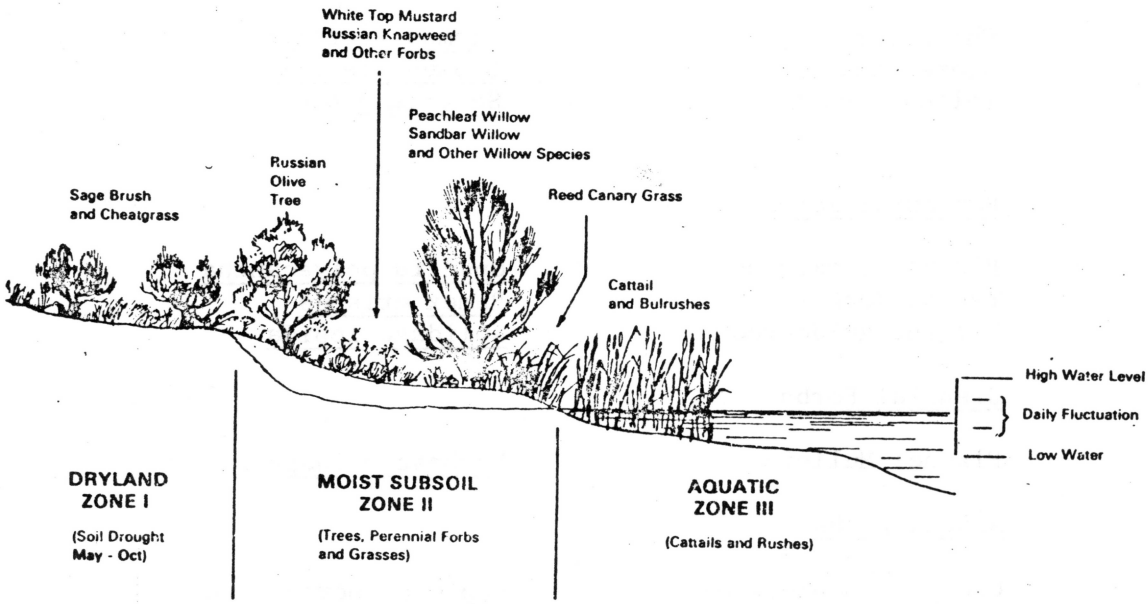
At the higher altitudes of the Blue Mountain and Northern Rocky Mountain subdivision (Plate 6 displays regional vegetation subdivisions) coniferous forests dominate the vegetation. However, it is likely that hatcheries would be located in meadows where the deciduous trees would be present. The vegetation, especially trees listed above, would possibly be found in these meadows.

Detailed vegetation inventories will be prepared as the definite locations of hatchery sites are determined.

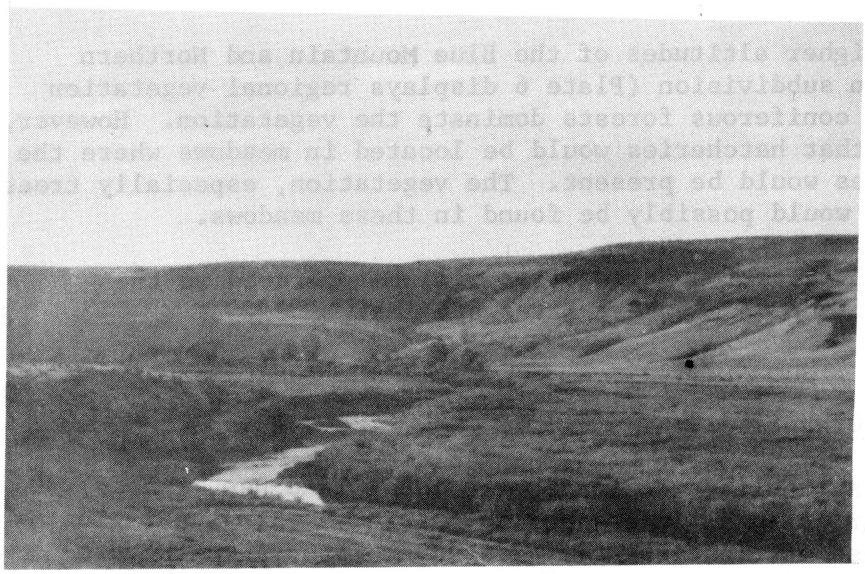
6. Aquatic Organisms

Because agriculture dominates the local land use, runoff water from agricultural lands carries nutrients into the region's streams. These nutrients supply additional impetus to the productivity of receiving waters. Most streams have more than adequate plant growth from which animals draw sustenance. Therefore, a large variety of wildlife inhabits the aquatic environment.

Plate 5 Lake Wallula Vegetation Zones

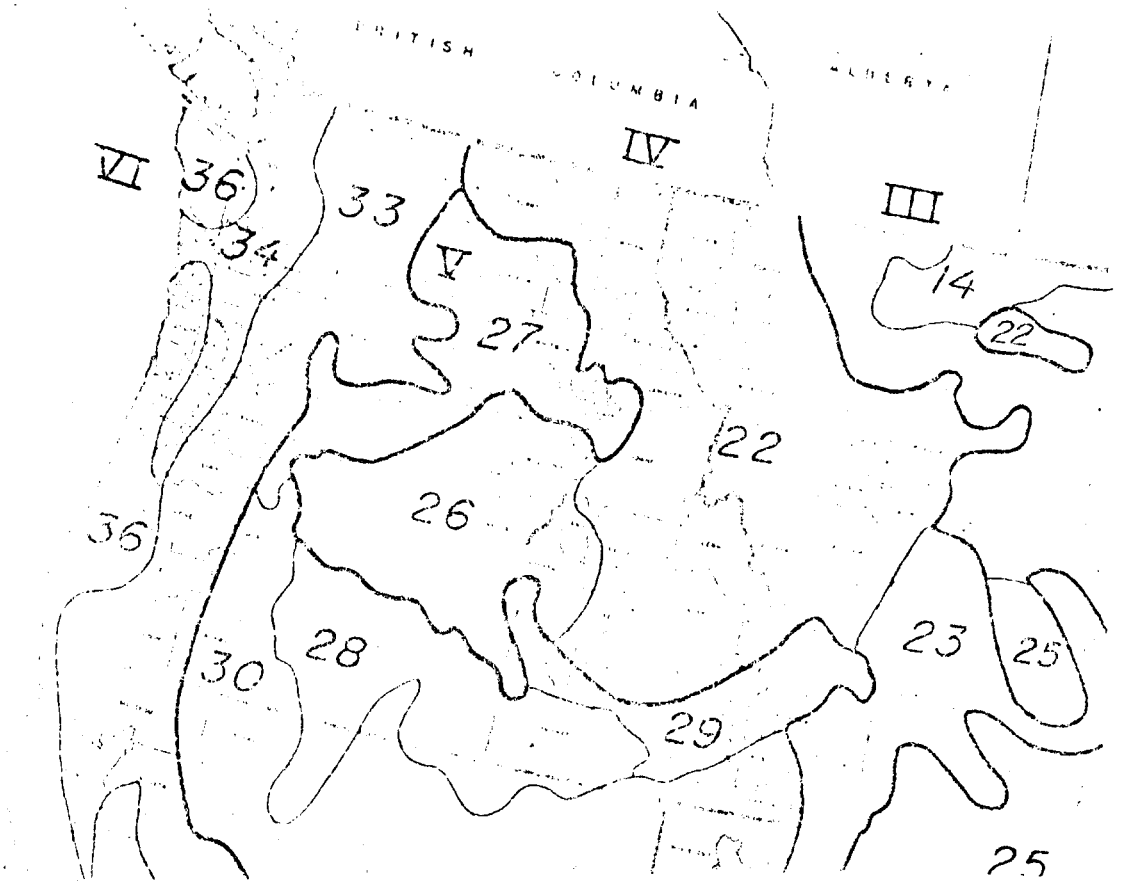


Source: See reference 35.



Walla Walla River

Plate 6 Vegetational Subdivisions



Source: See reference 15.

SUBDIVISIONS:

22 - North Rocky Mountain Subdivision

26 - Blue Mountain Subdivision

27 - Columbia Basin Subdivision

33 - Cascade-Klamath-Sierra Nevada Ranges

A general review of aquatic wildlife shows the streams to contain caddisfly, mayfly, stonefly, damselfly, and dragonfly nymphs. Various water beetles, backswimmers, water scorpions, rat-tailed maggots, mosquito larvae and other aquatic insects; but various worms, leeches, clams, and other invertebrates also inhabit the aquatic environment.

Plant and algae production supports numerous zooplankton as well as aquatic insects which in turn provide forage for small fish such as the redside shiner, speckled dace, leopard dace, and small trout. Small fry as well as some adults provide food for larger gamefish such as large rainbow trout and steelhead.

Fish, especially game fish, are the most familiar form of aquatic wildlife. They provide a valuable food resource as well as a recreational pleasure. There are 44 species of fish within the project area. Some of the better game and/or food fish are as follows:

(1) The chinook salmon, also known as the king, spring, and tyee, is recognized as king of salmon. It is a deep-bodied fish with lengths up to 58 inches and a maximum weight of 126 pounds, though most individuals are much smaller, weighing from 10 to 45 pounds at 24 to 36 inches in length. Chinook are normally four years old at maturity but may range from three to seven years old. Although large runs occur in the Columbia River system, the chinook salmon is found from central California to Alaska and across the Bering Sea to Japan. Chinook salmon are often grouped into three major categories according to the time of adult migration--spring run, summer run, and fall run.

(2) The Coho salmon, also known as the silver, are smaller and shallower in body depth than chinook, attaining lengths to 38 inches and weights to 31 pounds, though most individuals spawn at 6 to 12 pounds at 24 to 30 inches in length. Often confused with chinook, silver salmon are distinguished by the absence of black spotting on the dorsal fin and the lower lobe of the tail. Coho are three years old at maturity. As wide ranging as the chinook, the silver is predominantly seen from southern Oregon to southeastern Alaska. Spawning migrations occur in the fall. Of all the salmon, the silver is probably the most adaptable to changing conditions.

(3) Sockeye salmon, also known as blueback and kokanee (landlocked), are smaller than chinook and coho, attaining a maximum length of 33 inches and weights to 15-1/2 pounds, though most individuals spawn at 4 to 6 pounds at 18 to 24 inches in length. Columbia River sockeye are normally four years old at maturity. Spawning only in streams having lakes at the headwaters, the sockeye is common from the Columbia River north to northern Alaska. It normally migrates up the Columbia in June and July.

(4) Steelhead trout rival coho salmon in size, attaining a maximum length of 45 inches and weights to 43 pounds, although normal adult size is 6 to 20 pounds and lengths from 24 to 36 inches. Generally its head is more rounded in front and shorter than that of the salmon. Spotted like a chinook salmon, the steelhead trout also has a red band extending along its side after it has been in fresh water for some time. The adult steelhead, which is a sea-run rainbow trout, migrates in the lower Snake River most heavily in August, September, and October. It ranges from southern California to southeastern Alaska.

(5) American shad is a member of the herring family which was introduced to the West Coast near San Francisco, California, in 1871. It appeared in the Columbia River around 1876. Native to the Atlantic Coast, the American shad attains lengths to 30 inches, weights to 10 pounds, though usual size is 18 to 24 inches in length and weights from 2 to 6 pounds. It has a single spineless dorsal fine, a forked tail, and a deep, compressed body. An anadromous fish, the shad enters fresh water to spawn, with the largest migration occurring in July. On the Pacific Coast the shad is common from San Diego to Alaska. The Columbia produces 75 percent and more of the west coast shad and shad roe for commercial purposes.

The estimated number of both adult and juvenile salmon, steelhead, and shad, and their seasonal migration patterns, are graphically shown for the Snake River in Chart 1. On the subsequent page, Chart 2, the yearly record of juvenile out-migration for the Snake River (Ice Harbor Dam) is diagrammed. Since the juvenile anadromous fish do not pass the counting stations at the various dams, but instead move through the powerplants or over the spillways, the figures indicated are estimated, based in part on a sampling procedure, upstream spawning area observation, and judgment. Estimates differ, as can be noted from the two charts.

The fish life in the region varies greatly, depending on several conditions. Such things as water temperature and chemistry, habitat, spawning grounds, and food sources are major factors that determine the types of fish found in the still and flowing waters of the tri-state region.

The Snake River, from its mouth at the Columbia River to Brownlee Dam, the base area considered in this statement, is the home for diverse populations of fish. Resident game fish found in the river include smallmouth bass, crappie, sturgeon, and channel catfish, all of which present a sport fishery to anglers at various points along the slackwater system.

Chart 1

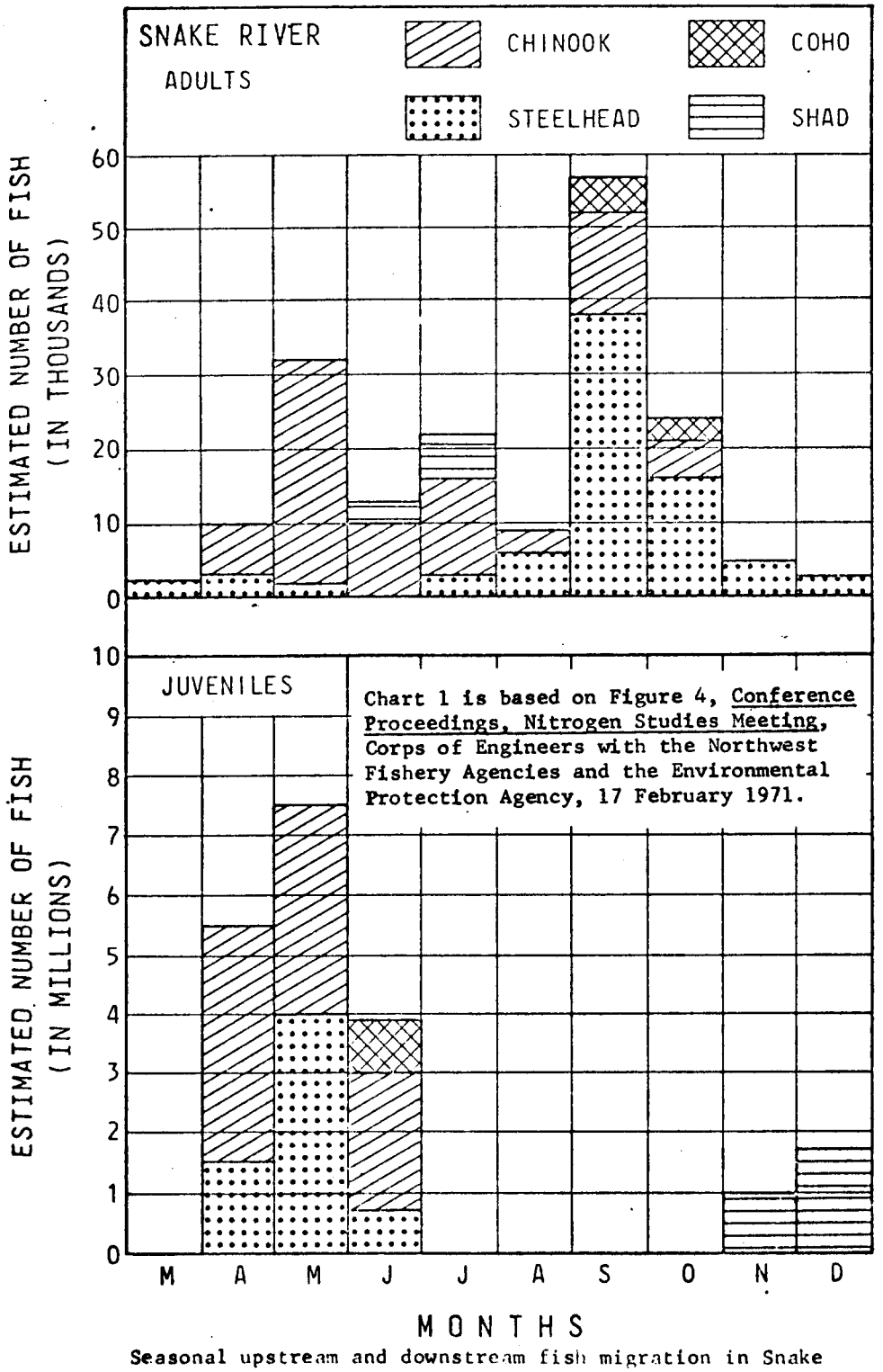
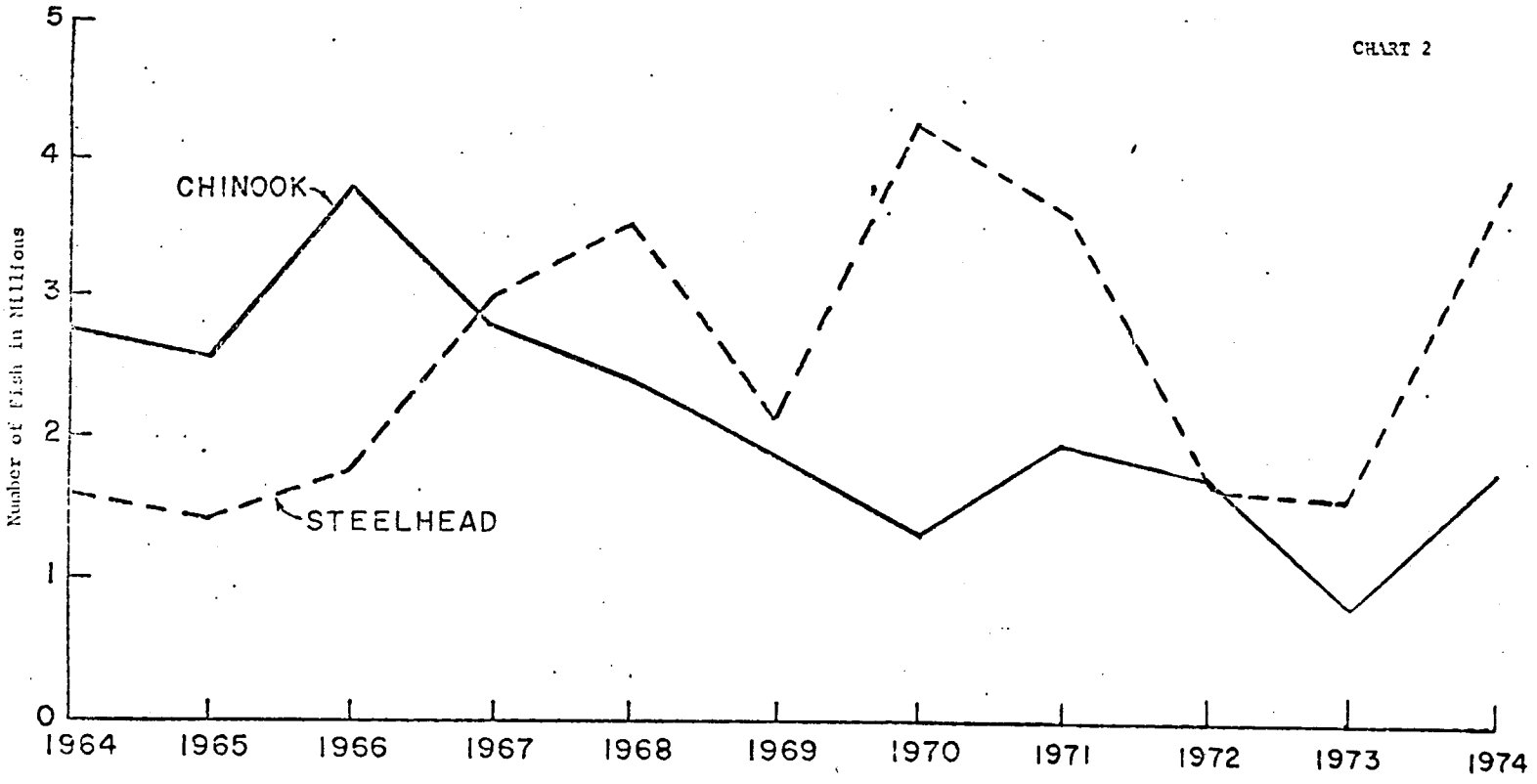


Chart 1 is based on Figure 4, Conference Proceedings, Nitrogen Studies Meeting, Corps of Engineers with the Northwest Fishery Agencies and the Environmental Protection Agency, 17 February 1971.

Seasonal upstream and downstream fish migration in Snake River (March through December). Figures represent a typical average year with both natural and hatchery produced fish.



Record of juvenile chinook salmon and steelhead trout in the Snake River (Ice Harbor Dam), 1964-1974. This chart is based on Figure 2, A Summary of the 1969 and 1970 Out Migration of Juvenile Chinook Salmon and Steelhead Trout from Snake River, H. L. Raymond, September, 1970; and is updated by information in Snake River Runs of Salmon and Steelhead Trout: Trends in Abundance of Adults and Downstream Survival of Juveniles, Seattle: National Marine Fisheries Service, November, 1974 by H. L. Raymond.

Migratory fish using the impounded river in large numbers are steelhead and chinook salmon. American shad enter the mouth of the Snake River in large numbers; 318,377 shad surmounted McNary Dam downstream on the Columbia River in the summer of 1973. Only about 11,000 shad passed over Ice Harbor Dam, however. Although no count is available, a generous portion of the shad spent some time congregated below Ice Harbor and offered an active sport fishery to local anglers.

Smallmouth bass, white crappie, and white sturgeon are also available in portions of the lower Snake River. Large populations of non-game fish reside in the impoundments. These fish include carp, squawfish, suckers, chiselmouth, peamouth, and redside shiners among the species found there.

The tributary streams of the Snake River range from slow rivers such as the Palouse, which carry high sediment loads, to sparkling mountain rivulets such as creeks of the Blue Mountains in Washington and the Bitterroot Mountains along the Montana-Idaho border.

The variety of fish in the high creeks and streams is less than that of the lower Snake River. However, the percentage of game fish is likely to be greater.

Trout (rainbow, cutthroat, Dolly Varden, and brook) are common residents of the feeder streams and brown trout are found in a few locations. The mountain whitefish is another game fish inhabiting these streams, and these sleek fish offer sport to anglers, especially in the winter months. Non-game fish in the higher elevation side streams consist mainly of long nose dace, sculpin, redside shiner, northern squawfish, speckled dace, and chiselmouth. Appendix C lists the fish which inhabit the project area.

7. Terrestrial Wildlife

A great variety of terrestrial wildlife inhabits the project area. During a year the project area may provide habitat for more than 255 bird species. Mammals within the area number approximately 91 species, while reptiles number around 21 and amphibians are estimated at about 13 species. Depending on the availability of suitable habitat for each animal, any particular animal's density varies throughout the project area.

In the appendix section there are lists of animals which could inhabit the project area. Appendices D, E, and F list the species of the reptiles and amphibians, birds, and mammals, respectively. Other animals not on these lists may occur in the project area, but current information is insufficient to establish their range within the project area. When the Corps has selected the hatchery sites, biologists will prepare a detailed wildlife inventory.

8. Threatened Species of Wildlife

Four species of nationally endangered wildlife occur within the three states of Idaho, Oregon, and Washington: The American Peregrine falcon (Falco peregrinus anatum), California brown pelican (Pelecanus occidentalis), Aleutian Canada goose (Branta canadensis leucopareia), and the Columbia White-tailed deer (Odocoileus virginianus leucurus). 1/ The area contains the American peregrine falcon and the Aleutian Canada goose.

The nationally endangered species require protection from any additional impact which may reduce their chances for survival. These animals are threatened with extinction.

The Endangered Species Conservation Act of 1969 indicates that "(C) A species of native fish and wildlife shall be regarded as threatened with extinction whenever...its existence is endangered because its habitat is threatened with destruction, drastic modification, or severe curtailment, or because of overexploitation, disease, predation, or because of other factors, and that its survival requires assistance."

Within the states of Idaho, Oregon, and Washington, other animals are also threatened. Wildlife studies indicate what classification these animals should have; i.e., rare, peripheral, or status-undetermined. A classification of rare (R) means the animal may become endangered if its population decreases further. A classification of peripheral (P) means the animal occurs as a migrant with the main populations residing outside this country. A classification of status-undetermined (SU) means that available information is insufficient to determine the animal's situation.

Threatened fish occurring in the three states are: the arctic grayling (R-Montana form), Thymallus articus; Olympic Mudminnow (R), Novumbra hubbsi; Alvord Basin cutthroat trout (SU), Salmo Clarki subsp.; and the Lost River sucker (SU), Catostomus luxatus. Although these fish inhabit at least one of the three states, none inhabit the project area.

1/ The Fish and Wildlife Service within the Department of the Department of the Interior compiles the endangered species list. The 1973 edition of Threatened Wildlife of the United States indicated that these four animals are the only endangered species within these three states. Additional endangered species may inhabit the project area, but the information available is insufficient to place them on the endangered list.

Concerning threatened bird species, those inhabiting the three states are: The Tule white-fronted goose* (R), Anser albifrons gambelli and Anser albifrons frontalis; the prairie falcon* (R), Falco mexicanus; Cascade boreal chickadee (P), Parus hudsonicus carolinensis; white-faced ibis* (SU) Plegadis chihi; American osprey* (SU), Pandion haliaetus carolinensis; Western snowy plover* (SU), Charadrius alexandrinus nivosus; Ferruginous hawk* (SU), Buteo regalis; Columbian sharp-tailed grouse* (SU), Pediocetes phasianellus columbianus; northern long-billed curlew* (SU), Numenicus americanus parvus; western burrowing owl* (SU), Speotyto cunicularia hypugaea; and the Yakutat fox sparrow* (SU), Passerella iliaca annectens.

Threatened mammals which inhabit at least one of the three states are: The spotted bat (R), Euderma maculatum; northern Rocky Mountain wolf (R), Canis lupus irremotus; grizzly bear (R), Ursus arctos horribilis; sea otter (R), Enhydro lutris nereis; California bighorn* (R), Ovis canadensis californiana; mountain caribou (P), Rangifer tarandus montanus; fisher (SU), Martes pennanti; wolverine (SU), Gulo luscus; Canada lynx* (SU), Lynx canadensis.

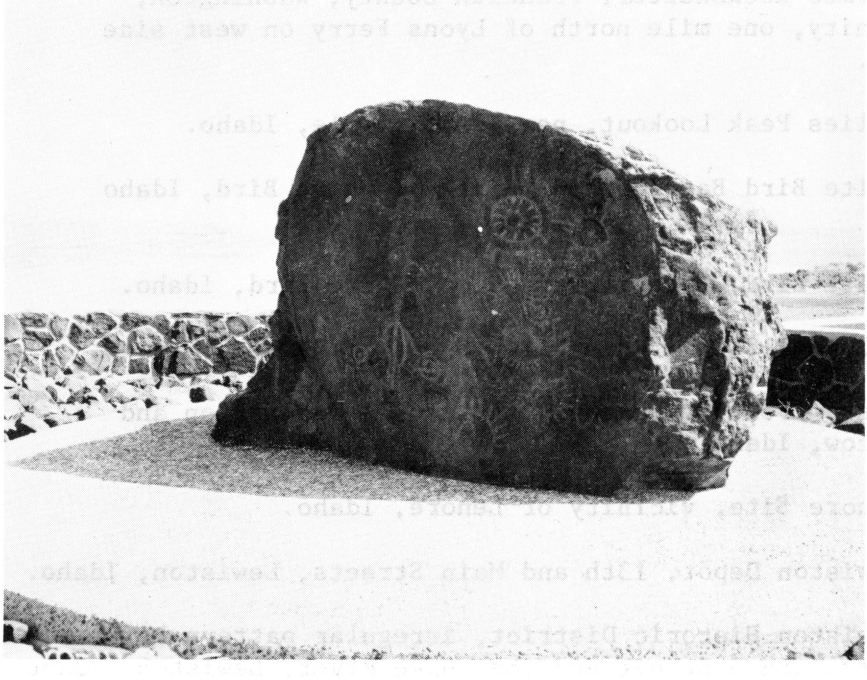
The northern Rocky Mountain wolf (R) may inhabit the area, but the record is not clear concerning its range.

The area could contain 14 species of threatened birdlife and three species of threatened mammals. Wildlife surveys at the hatchery sites, when selected, will provide detailed information on wildlife including threatened species. Rare and endangered species will also be considered in selection of fishing and wildlife acquisition areas.

* This animal occurs in the area under consideration.

9. Archaeology

A most important factor in man's survival has always been water. All life must have adequate supplies of water to survive. Within the Columbia region prehistoric man primarily lived near the rivers. He would spear and trap migrating adult salmon as well as other fish in shallow river areas. There are many known archaeological sites along the streams of the region, as well as many probable unknown sites. The floods and meanderings of the streams and rivers have changed their channels several times over the past millenniums. Also, prehistoric man was believed to be semi-nomadic. When food supplies became scarce or other problems developed, he would move his village to a more promising location. The exact location of ancient villages must be determined on a case-by-case investigation, but the possibility of finding archaeological artifacts and fossils near the rivers is very likely. New sites of archaeological interest may be uncovered prior to or during hatchery construction. The effects of hatchery construction and operation on possible archaeological findings are discussed in Section 4 of this statement.



Petroglyphs

10. National Historical Sites

The area contains sites which are National Historic Places listed in the National Register of Historic Places, 10 February 1976. These historical sites are as follows:

(1) Lolo Trail, Clearwater County, Idaho (also in Idaho County, Idaho, and in Missoula County, Montana), Lolo Hot Springs vicinity, parallel to U.S. 12 on ridges of Bitterroot Mountains, from Lolo Pass to Weippe.

(2) Nez Perce National Historical Park, Clearwater County, Idaho (also in Idaho, Lewis, and Nez Perce counties), Spalding (park headquarters), within an area 90 miles south and 150 miles east of Spalding.

(3) Weippe Prairie, Clearwater County, Weippe vicinity, south of Weippe and Idaho 11.

(4) Whitman Mission National Historic Site, Walla Walla County, Washington, Walla Walla vicinity, 6 miles west of Walla Walla off U.S. 410.

(5) Marmes Rockshelter, Franklin County, Washington, Lyons Ferry vicinity, one mile north of Lyons Ferry on west side of Palouse River.

(6) Wylies Peak Lookout, near Grangeville, Idaho.

(7) White Bird Battlefield, north of White Bird, Idaho off U.S. 95.

(8) White Bird Grade, northeast of White Bird, Idaho.

(9) McConnell, W.J. House 110, S. Adams Street, Moscow, Idaho.

(10) Moscow Post Office and Courthouse, Washington and 3rd Streets, Moscow, Idaho.

(11) Lenore Site, vicinity of Lenore, Idaho.

(12) Lewiston Depot, 13th and Main Streets, Lewiston, Idaho.

(13) Lewiston Historic District, irregular pattern between 1st and 5th Streets and B Street and the Snake River, Lewiston, Idaho.

(14) Ascension Episcopal Church and Rectory, Church Street, Cove, Oregon.

(15) Full Gospel Church (Grace Presbyterian Church), 1st and Monroe Streets, Asotin, Washington.

(16) Van Arsdol, C.C. House, 15th and Chestnut Street, Clarkston, Washington.

(17) Columbia County Courthouse, 341 E. Main, Dayton, Washington.

(18) Dayton Depot, 2nd and Commercial Streets, Dayton, Washington.

(19) Garfield County Courthouse, 8th and Main Streets, Pomeroy Washington.

(20) Lewis and Clark Trail, Travois Road, 5 miles east of Pomeroy, Washington, U.S. 12.

(21) Bruce, William Perry House, 4th and Main Streets, Waitsburg, Washington.

(22) Dacres Hotel, 4th and Main Streets, Walla Walla, Washington.

(23) Fort Walla Walla Historical District, 77 Wainwright Drive, Walla Walla, Washington.

(24) Kirkman House, 214 N. Colville Street, Walla Walla, Washington.

(25) Memorial Building, Whitman College, 345 Boyer Avenue, Walla Walla, Washington.

(26) Walla Walla Public Library, 109 South Palouse Street, Walla Walla, Washington.

11. Socioeconomics

On a general basis, the tri-state region has shown a 14.8-percent population growth over the 1960-1970 decade. However, the average population density of the project area is approximately 13 people per square mile. The economic base is largely agricultural and timber production. High production of wheat, peas, paper, and plywood occurs within the area. Agriculture-related industries such as chemicals, processing, and transportation of agricultures products are also present.

The median family income for 1969 in Washington was $10,407, while in Oregon it was $9,489, and in Idaho $8,381. National median family income for 1969 was $9,590. (Incomes are derived from 1970 census.)

The current estimated values for the commercial catch from the project area's fisheries is $726,000 for fall chinook, $3,205,620 for spring and summer chinook, and $198,000 for steelhead. The estimated value for the anadromous sport fisheries is $7,083,000. The estimated value of the residential sport fisheries is $410,000 @ 2.00/day. The estimated total value of the fishery from the

Table 4

COMMERCIAL LANDINGS AND SPORT FISHING USE, WITH AND WITHOUT COMPENSATION [1/] IN COLUMBIA RIVER SYSTEM AND PACIFIC OCEAN (ANADROMOUS SPECIES) AND IN LOWER SNAKE RIVER PROJECT AREA (RESIDENT SPECIES)

Areas and Species	Commercial Fisheries									Sport Fisheries [4/]		
	With Compensation			Without Compensation			Difference					
		Landings			Landings			Landings		W/Comp.	WO/Comp.	Diff.
	Escapement	Pounds	Value	Escapement	Pounds	Value	Escapement	Pounds	Value	Ang. Days	Ang. Days	Ang. Days
Columbia R. System, Ocean												
Fall Chinook [2/]	32,700	1,668,000	$1,651,320	14,400	734,000	$ 726,660	18,300	934,000	$ 924,660	163,500	72,000	91,500
Spring and Summer Chinook [2/]	122,200	6,232,000	6,169,680	63,500	3,238,000	3,205,620	58,700	2,994,000	2,964,060	611,000	318,000	293,000
Steelhead [3/]	114,800	692,000	380,600	59,700	360,000	198,000	55,100	332,000	182,600	763,000	397,000	366,000
Totals	269,700	8,592,000	$8,201,600	137,600	4,332,000	$4,130,280	132,100	4,260,000	$4,071,320	1,537,500	787,000	750,500
L. Snake Project Area												
Resident										250,000	205,000	45,000

1/ Insofar as possible "with compensation" is intended to reflect the preproject condition.

2/ Calculations based on catch to escapement ratio of 4:1 (commercial catch 3:1 and sport catch 1:1) average weight per fish of 17 lbs.; and commercial value of $0.99 per lb. for Chinook, based on 1973 prices.

3/ Calculations based on catch to escapement ratio of 2:1 (commercial catch 0.67:1 and sport catch 1.33:1); average weight per fish of 9 lbs.; and commercial value of $0.55 per pound, based on 1973 prices.

4/ Angler-days for anadromous fish are based on catch to escapement ratios (footnotes 2 and 3) and an estimated 5 days of effort per fish (the value of an angler-day for anadromous fish is $9.00). Angler-days for resident fish are based on creel studies of Washington Department of Game and the ratio of 3 reservoir angler-days to 2 stream angler-days.

From BSF&W-NMFS Report as revised by correspondence.

Source: See reference 19.

project area is $11,623,280. Table 4 contains an analysis of the fishery value. Based on 1973 harvest figures, wildlife-oriented use in southeast Washington is valued at $27,288,651.

12. Recreation

The region contains 129 known publicly owned recreational sites. Current estimates indicate that 39 private campsites also exist in the project area. The public recreational sites number as follows: 9 state-maintained facilities with campsites; 2 state-maintained facilities without campsites; 79 Federally maintained recreational sites with campsites; 13 Federally maintained recreational sites without campsites; 19 interest points, and 7 areas used for snow skiing.

This region contains a variety of vegetational cover from sagebrush steppe to coniferous forest. This variety provides many diverse forms of recreation to local residents. Various forms of hunting, hiking, skiing, picnicking, fishing, swimming, and bicycling are available within the project area. Table 5 indicates the results

Pheasant Hunting

Summer 1972 Recreation Activities by Percent of National Recreation Survey Respondents Who Participated; Estimated Total U.S. Participation for the Summer Quarter of 1972; Percent of Recreation Occurring on Weekends; and Average Hours of Participation per Activity Day

Activity	Percent of Survey Respondents Who Participated	Estimated Total U.S. Participation for the Summer Quarter of 1972 (Millions of act. days)	Percent of Activity Which Occurred on Weekends	Average Number of Hours of Participation per Activity Day
Picnicking	47	405.1	71	2.7
Sightseeing	37	362.8	62	3.1
Driving for pleasure	34	404.9	[1]	[1]
Walking for pleasure	34	496.3	64	1.9
Other swimming outdoors	34	487.1	69	2.6
Visiting zoos, fairs, amuse. parks	24	122.5	55	4.5
Other activities	24	242.9	[1]	[1]
Fishing	24	278.2	68	4.4
Playing other outdoor games or sports	22	338.8	65	2.6
Outdoor pool swimming	18	257.0	52	2.8
Nature walks	17	148.9	70	2.0
Other boating	15	126.1	74	2.8
Going to outdoor sports events	12	96.9	57	4.2
Camping in developed camp grounds	11	153.3	62	[2]
Bicycling	10	214.2	69	2.0
Going to outdoor concerts, plays, etc.	7	26.5	66	3.6
Horseback riding	5	51.5	51	2.7
Hiking with a pack/mount/rock/climb.	5	45.0	62	3.0
Tennis	5	81.2	79	2.1
Water skiing	5	54.1	69	2.6
Golf	5	63.4	51	4.9
Camping in remote or wilderness areas	5	57.5	80	[2]
Riding motorcycles off the road	5	58.2	62	4.0
Bird watching	4	42.0	75	2.1
Canoeing	3	18.3	72	2.3
Sailing	3	32.5	75	4.4
Hunting	3	17.5	64	4.4
Wildlife and bird photography	2	19.6	56	1.6
Driving 4-wheel vehicles off the road	2	26.6	56	3.1

[1] Was not compiled from NRS.
[2] Defined to be one activity day.

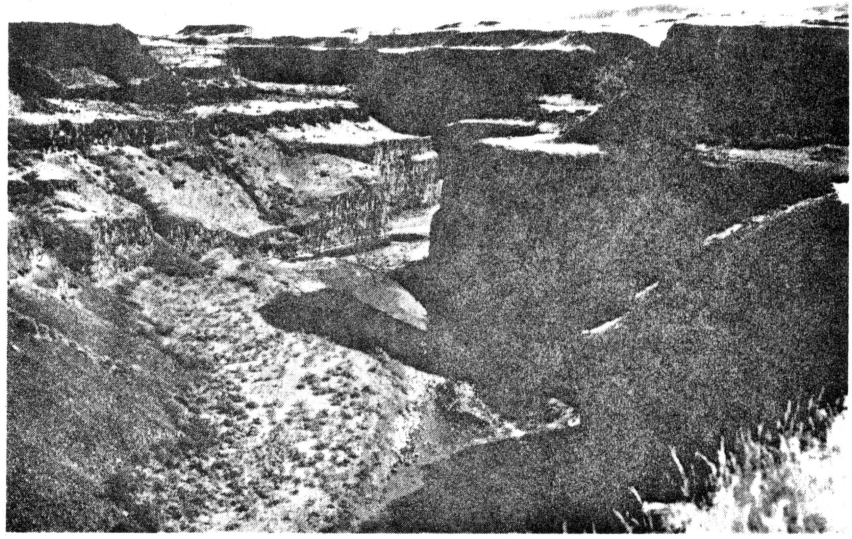
Table 5

Source: Bureau of Outdoor Recreation, Outdoor Recreation A Legacy For America, Washington: U.S. Department of the Interior, 1973.

of a National Recreation Survey on activity participation for the summer of 1972. That table shows how Americans spent their recreation time. Although it is a table for the nation as a whole, the figures given are indicative of the types and popularity of activities. 1/

13. Esthetics

A person may find many features of the region to be esthetically pleasing. However, because esthetics is basically subjective, it is hard to identify what everyone would consider attractive. The area contains many diverse vegetational and topographical perspectives. Streambanks within the project area can contain a variety of vegetation. Sagebrush steppe, hardwood forest, softwood forest, and grasslands are a few vegetational possibilities. The headwaters of the streams in the project area range from high rugged mountains (about 10,000 feet) to flat plateaus (about 340 feet). The area also displays seasonal variations which add to the area's possibilities.



Palouse Canyon

1/ Since the table is for the summer quarter, hunting does not rank as high as might be expected. It should be remembered that much hunting in the region is done in the fall and early winter.

The project area contains some highways which are considered scenic routes. These are: Oregon State Highway 82; Washington State Highways 26, 27, 126, and 127; and Idaho State Highways 8, 11, 13, and 14; almost all of U.S. Highway 12; and all of U.S. Highway 95. The Federal and State roadstops, parkland, or forest land are usually established in esthetically pleasing surroundings.

The region contains part of the wild and scenic Clearwater River in Idaho. Potential wild and scenic rivers within the project are the Grande Ronde, Wallowa, Minam, Wenaha, Snake (middle segment), and Immaha. In addition to these possible scenic rivers, the Eagle Cap Wilderness Area in Oregon is within the region. The wilderness area is considered appealing as a naturalistic setting.

Waterfowl provide a delightful ballet of flight for the non-hunter as well as a recreational outlet for the hunter.

III THE RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS

FISH HATCHERY SITING

Even though the Columbia Basin Fishery Technical Committee has recommended only recently some possible hatchery locations, the hatchery siting determinations have not been finalized. At this time it is not possible to ascertain the exact nature of impacts that hatchery construction would have on current land use plans. In general, hatchery development would preclude each of the sites from other use, such as farms, residential, or natural areas. Hatchery development could provide a park-like area for local inhabitants. More exacting information would be available as further planning occurs.

WILDLIFE HABITAT LANDS

The development of wildlife habitat would commit the land to this use, but low density recreation could also occur. Wise ecosystem management would not only increase wildlife habitat availability but also provide the best possible use in relation to agricultural and water supply factors as well. For the existing project lands a wildlife habitat plan has been prepared. On existing Lower Snake River Project lands, a total of 22 potential wildlife habitat development sites have been identified. See Appendix G. Plates 1 through 8 in that Appendix show the areas that are believed to be likely areas for habitat establishment. This use would be consistent with project land use plans.

The locations of possible off-project habitat compensation lands are currently unknown. Therefore, it is not possible to give specific effects of such habitat development on land use plans.

Most of the lands in the region which might be devoted to habitat development are now rangeland or agricultural in nature. There are no known state and/or county land use plans with which the proposed acquisition program would be in conflict. In the instances of easement acquisition the present uses of land would be maintained. Only in the case of fee title acquisition could the existing land uses be altered. Even in this instance, the agricultural nature of the proposed 400 acres of riparian vegetation would be maintained since it would be necessary to grow both food and cover crops on the land that would be acquired.

As noted above, a habitat development plan for project lands has been prepared. Much emphasis is being placed upon the management of existing project lands for the benefit of wildlife. The proposed acquisition of easements on the 15,000 acres of rangeland surrounding the project would be directly related to wildlife habitat development and/or preservation on project lands. It is planned that a modest amount of development would be undertaken on the rangeland to improve its ability to support wildlife. In general, this would consist of developing watering devices for the wildlife species. These watering devices would be generally inconspicuous and would have no effect on the primary use of the areas for cattle grazing.

Other development on the fisherman-access easements and on the hunter-access easements would be limited to providing small parking areas, litter barrels, and vault toilets. The aim of this type of development would be to prevent the degradation of areas of high use and would provide benefits to both the landowners and the general public. It is not planned to place these facilities at all easement sites; rather, they would be provided where it appears that the amount of public use would justify such developments. Utmost consideration would be given to protecting the landowner's primary use of his land. These facilities are one way of assuring that his rights are not infringed.

The project lands which were purchased by the Government for the four Lower Snake River reservoirs result in a total of about 25,500 acres between the water and the project boundary. Much of this land is steep and sparsely vegetated. Some areas of project land are used for developed parks and for port facilities. Port areas have been sold to local port districts.

IV ENVIRONMENTAL IMPACT OF PROPOSED ACTION

The environmental impacts of the proposed compensation measures are generally discussed in this section, in the same order as the various component topics noted in the discussion of the environmental setting. Under each topic, fishery impacts are noted first, followed by discussion of impacts from the wildlife program.

1. Climate

The proposed fishery program should not affect the regional climate. It cannot be predicted at this time what small effects hatchery development would have on local climatic regimes; however, the effect is not expected to be significant. When locations for hatcheries have been selected and general designs established, it will then be possible to better determine the localized effects.

The development of wildlife habitat and the resulting increase in wildlife populations would not alter the regional climate. The increase in vegetation could result in a small climatic change in local areas.

Winter Snowfall

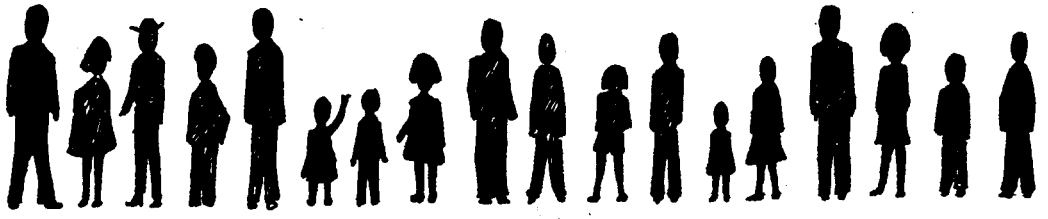
2. Air Quality

Hatchery construction would affect the air quality in the area. Operation of equipment would result in increases in hydrocarbons, particulates, carbon monoxide, photochemical oxidents, and nitrogen oxides. The burning of trash and slashings, as well as wind erosion at the site, would add to the suspended particulate concentration of the area.

However, the effect of the project on air quality should not be significant considering the existing high air quality of the project area and the minor contributions from hatchery construction.

Hatchery operation would also produce some air pollutants. The effect of hatchery operation should be much less than hatchery construction. The effects of hatchery operation on air quality can be determined more exactly after the plans are developed.

The development of wildlife habitat and the resulting increase in wildlife population would affect air quality. A major component affecting air quality would be the release of pollen from the various plants. Pollen would add to the suspended particulates of the area. It is not known if the pollen from the planted habitat species would be more or less annoying to people with allergenic problems.

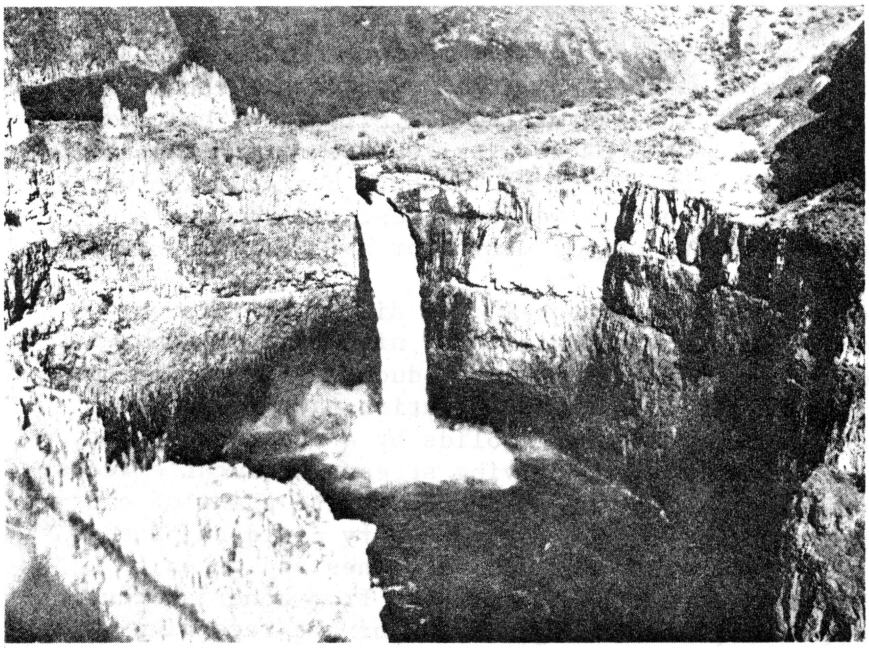


Vegetation development on a permanent basis would add to the holding power of the topsoil in some areas. This would reduce wind erosion and the amount of suspended dust particles. Dust would be generated where equipment would be used in the planting of grain or hay for wildlife food patches. Also, the dust from hunter vehicles on dirt and gravel roads would be a seasonal factor.

3. Geology

The proposed hatcheries should not affect the existing geology of the area. The short-term removal of water from local streams for hatchery use would slightly reduce their sediment-carrying capacity and erosiveness. However, if the hatchery were withdrawing from a large stream, this aspect would be insignificant. Overall, the fishery program should cause little impact to geologic resources. Some local ground surface rearrangement would occur at the hatchery sites.

The development of wildlife habitat and the resulting increase in wildlife populations would not affect the geologic evolution of the region. However, the establishment of dense vegetation would reduce soil erosion in some areas, and irrigation of food patches could increase the amount of ground water contained in the soil. These would be local effects.



Palouse Falls

4. Water Quality

(1) Hatchery Construction

Rainfall runoff from hatchery sites would cause increased turbidity in any nearby stream. Increased turbidity would continue to occur until re-vegetation had stabilized the soil and retarded erosion. Water intake construction would disturb the bottom sediments of the river. Direct disturbance of the river bottom would cause an additional turbidity problem. Because the streams are freshwater, the suspended sediments would cloud the river for many miles. Cofferdams would reduce the amount of siltation in the river during construction. However, cofferdam installation would create a slight turbidity increase.

(2) Hatchery Operation

The hatcheries' design for waste treatment has not been developed. The size of the hatchery and the waterflow of receiving waters are necessary factors in determining the effects of hatchery operation on water quality. When hatchery sites are determined and hatchery designs completed, the effect of hatchery operation on water quality can be made. The hatcheries would be designed to meet all state and Federal water quality requirements for hatchery discharges.

It is estimated that at each hatchery the discharge into the receiving waters could include: ammonia, BOD, nitrates, phosphates, and suspended solids. This effluent would produce low-level enrichment of the receiving waters. Due to the dilution factor within the hatchery effluent, prior removal of solids by a treatment plant, and a large volume of water in the receiving stream, effluent effects would probably be undetectable except at the immediate point of entry. By itself, the slight enrichment from each hatchery could be beneficial in terms of food production for native fishes and other aquatic life. Combined with possible enrichment from other sources, it could contribute to the possible degradation of the receiving waters.

Wastewater being returned to the river from the fish rearing facilities would not significantly alter the receiving water's temperature regime. Wastewater leaving the facilities would be about the same temperature as the receiving river water except during the summer months when pond water temperatures should be held to a maximum of 65^{o}F.

The method of disposal for human sanitary waste effluent is not known at this time. When the locations and design of the hatcheries have been established, it will then be determined what system would be used to treat sanitary wastes. Applicable water quality standards would be met.

In the wildlife program areas the increase in animal population would tend to create a slight increase in the nutrients placed on the land and contained in runoff from habitat development sites. Vegetation development would help prevent siltation of the receiving waters. This would reduce turbidity in the receiving waters. Restoration or development of riparian vegetation on denuded sites would lead to decreasing temperature of the water. Wildlife habitat development should indirectly increase nearby stream productivity.

5. Vegetation

Impacts of hatchery construction on vegetation would be limited to local areas. The site for a fall chinook hatchery would require approximately 40 acres. This hatchery would be constructed as near to the Lower Snake River Project area as possible but downstream from the project to minimize mortalities caused in passage through the four-dam complex. The spring and summer chinook hatcheries would require approximately 80 acres of land. The propagation facilities, which may be constructed as a single unit or multiple units, depending on site suitability, would be constructed upstream of the Lower Snake River Project to provide for the sport fisheries of eastern Oregon, eastern Washington, and western Idaho. The steelhead facilities would require approximately 80 acres. Separate hatchery facilities could be constructed upstream of the lower Snake River to provide for the sport fisheries of eastern Oregon, eastern Washington, and western Idaho. The resident fishery hatchery could be located somewhere in southeastern Washington and would require approximately 10 acres of land.

Hatchery construction would eliminate some of the vegetation at each hatchery site. Also, some lawn development would replace natural vegetation with a few grass species. Landscape architects would design the hatchery facilities to harmonize with the surrounding environment. However, the exact impact of hatchery construction on vegetation cannot be determined until hatchery locations and designs are developed.

The development of the proposed wildlife habitat lands would increase the amount as well as the characteristics of the vegetation in the region. In Appendix G,, Plates 2 through 5 display the preliminary analysis of wildlife habitat compensation along existing project riparian lands. Table 4 lists the vegetative species that are being considered for wildlife habitat development.

Development of habitat on the 500 acres of off-project land proposed for acquisition would be similar to that illustrated in Appendix G for the existing project lands. This change should be both quantitative and qualitative , as native species are to be used to the greatest extent practical.

Selected Potential Species for Restoration and Enhancement
Of Lower Snake River Lands

Prostrate Kochia	(Kochia prostrata)
Sunflower	(Helianthus annus)
Black thorn	(Prunus spinosa)
Arrowleaf balsam root	(Balsamorhiza sagittata)
Sumac	(Rhus glabra)
Blue lupine	(Lupinus sericeus)
Rabbit brush	(Chrysothamnus nauseosus)
Hackberry	(Celtis douglasii)
Wild rose	(Rosa woodsii)
Phlox	(Phlox longifolia)
Russian olive	(Elaeagnus angustifolia)
Rattlesnake brome	(Bromus brizaformis)
Bluebunch wheatgrass	(Agropyron spicatum)
Crested wheatgrass	(Agropyron cristatum)
Idaho fescue	(Festuca idahoensis)
Bitter brush	(Purshia tridentata)
Mt. ash	(Sorbus sitchensis)
Service berry	(Amelanchier alnifolia)
Blackberry	(Rubus laciniatus, R. ursinus)
Drop seed	(Sporobalus cryptandrus)
Hawthorne	(Crataegus douglasii)
Mulberry	(Morus alba)
Choke cherry	(Prunus viginiana)
Caragana	(Caragana arboresceus)
Red osier dogwood	(Cornus stolonifera)
Matrimony vine	(Lycum halimifolium)
Bladder senna	(Colutea arborescens)
Nanking cherry	(Prunus tomentosa)
Blueleaf honeysuckle	(Lonicera Korolkowii)
Vine clematis	(Clematis ligusticifolia)
Snowberry	(Symphoricarpos albus)
Canyon heather	(Eriogonum niveum)
Golden current	(Ribes aurem)

Table 4

6. Aquatic Organisms

(1) Effect of Hatchery Construction

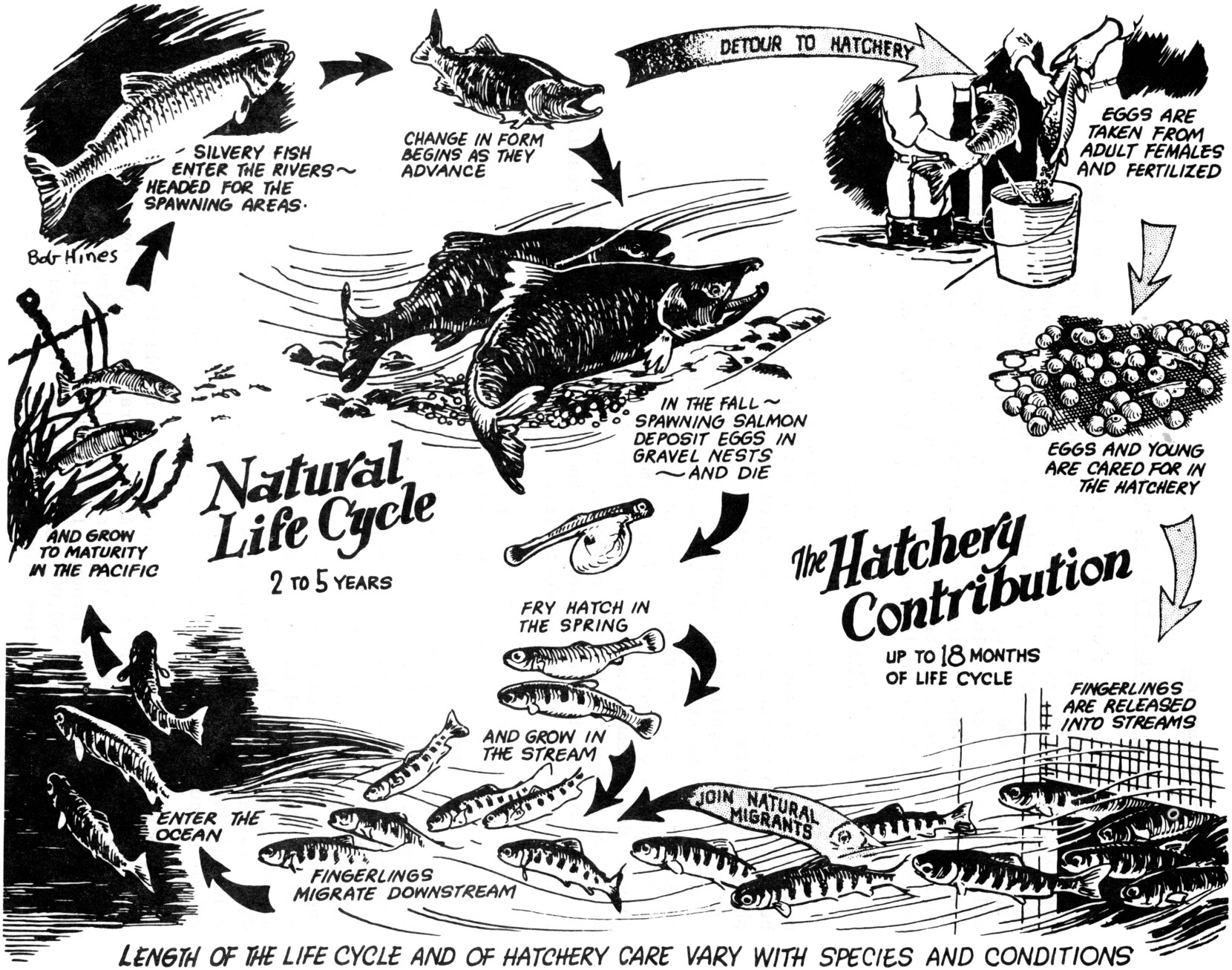
Fish ladder and/or cofferdam construction, as well as runoff, would cause siltation in the stream. Siltation reduces the basic productivity of the waters because the suspended silt decreases the availability of light for plant photosynthesis. Silt can also cover and destroy eggs and/or larvae of fish, crustaceans, mollusks, and insects. In addition to the problems associated with siltation, the construction of a cofferdam or other site grading would create other impacts which may affect the adjacent stream. Construction effects would cease when the hatchery was completed.

(2) Effect of Hatchery Operation

Untreated hatchery wastewater discharges containing the metabolic waste products of the fish and residual fish food have been found to increase the Biochemical Oxygen Demand (BOD), total phosphate, nitrates, and total solids of the receiving stream and can result in significant quantities of undesirable solids being deposited in the streambed at the hatchery outfall. Increased levels of certain "nutrient" compounds resulting from hatchery discharges have also been found to stimulate primary productivity (algae) downstream from hatcheries. This in turn results in increased numbers of benthic organisms such as mayflies, stoneflies, dragonflies, caddisflies, trueflies, and beetles. This would result in an increase in stream productivity.

Hatchery operation would use chemicals which affect aquatic wildlife. The rearing ponds may need intermittent treatment to prevent the spread of fish diseases. External parasites and most systemic bacteria are not expected to be a problem at the proposed hatcheries. Airborne pathogens, such as the spores of the common fungus Saprolegnia, and common soil myxobacteria which are the cause of bacterial gill diseases and columnaris (a systemic infection), would require chemical or drug control. It is possible that returning adults will be carriers of pathogens. However, rainbow trout eggs that are needed for hatching and rearing to meet the trout program should only be accepted from disease-free broodstock sources. When treatments for these diseases are necessary, chemical treatment will be confined to individual ponds or incubators; the entire water volume circulating through the hatchery will not be treated.

The purpose of the hatcheries would be to obtain satisfactory adult returns to spawning areas. At an average of 5,000 eggs per female fish, the hatcheries could raise millions of fingerlings. Fall chinook salmon would produce 11,450,000 eggs, spring and summer chinook would produce 9,650,000 eggs, and steelhead would produce 16,950,000 eggs. Hatcheries using recirculated water produce fish



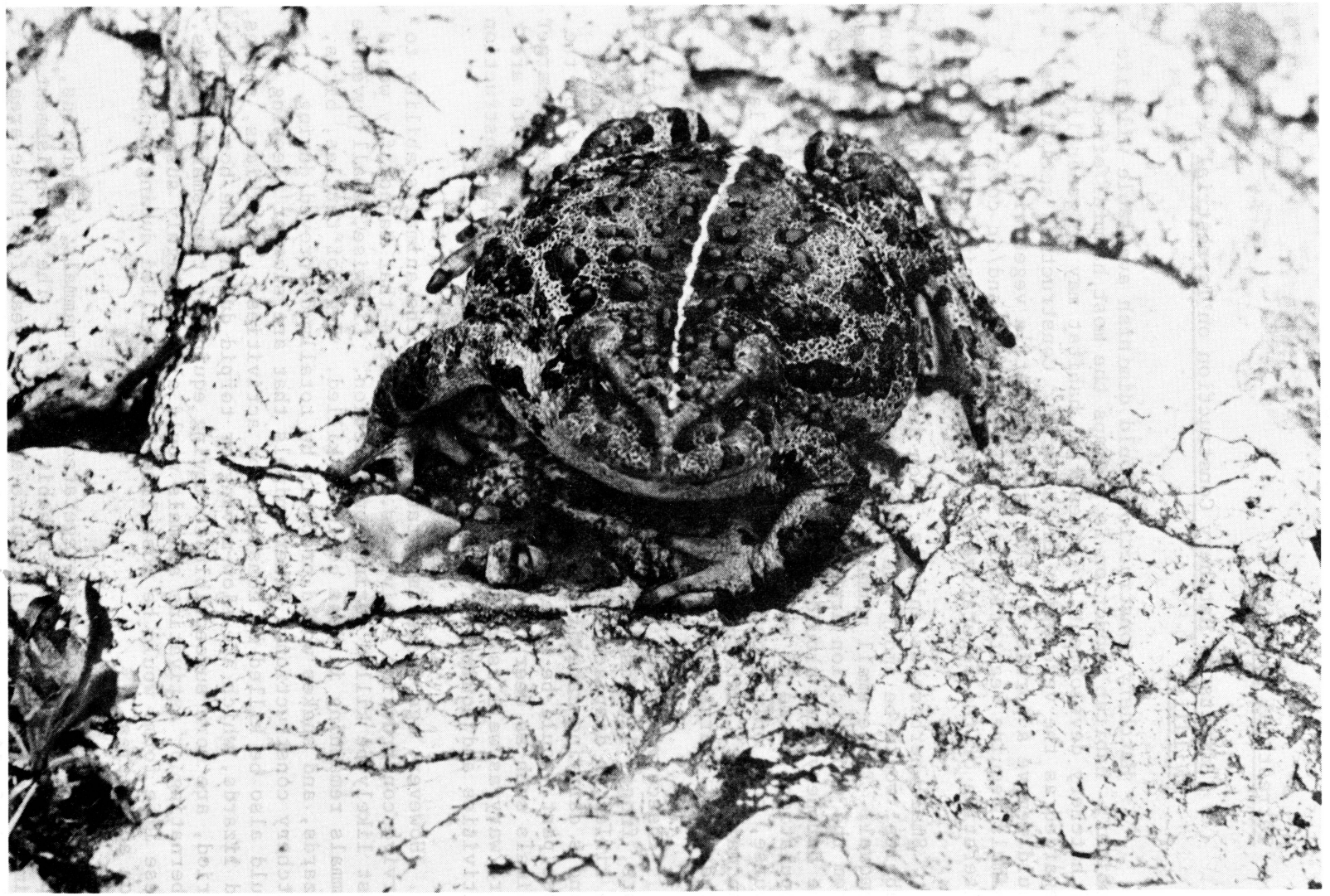
LENGTH OF THE LIFE CYCLE AND OF HATCHERY CARE VARY WITH SPECIES AND CONDITIONS

at a much faster growth rate than occurs in the wild. By 11 months, steelhead hatchery fish would be able to be released for downstream migrations. Fish raised in raw stream water require at least six additional months before they reach migration size. The average size of downstream migrants (called smolt) vary from species to species. The likelihood of species survival is enhanced because of decreased stream mortality among the eggs, fry, and fingerlings. Hatchery survival is near 75 percent, while natural survival is approximately 10 percent. Smolt losses during their seaward migration can be very high; therefore, high hatchery productivity is required to maintain the necessary spawning population of adult salmon to keep the species extant.

(3) Effects of Habitat Development

Overall, the development of shoreline wildlife habitat would tend to increase the productivity of the aquatic environment. Some shade over the water may be provided as trees mature. Vegetation establishment would reduce the siltation in the receiving waters by reducing soil erosion on the adjacent lands. The vegetation would increase the population of insect life in the area, which is a major food source for fish. Addition of organic matter and nutrients to the land ecosystem could eventually result in small increases of these materials into the aquatic ecosystem. This would add to the stream's productivity.

Fishing in Dworshak Reservoir



The Western Toad (Bufo boreas) captures grasshoppers, flies, and the interests of naturalists who enjoy observing non-game species.

7. Terrestrial Wildlife

(1) Effects of Hatchery Construction on Terrestrial Wildlife

Hatchery construction would diminish available wildlife habitat. Habitat reduction is perhaps the most harmful effect of hatchery development. Terrestrial habitat may be generally regarded as the vegetation in the area. Construction activities would remove a portion of the hatchery site's vegetation. Wild animals require vegetation for food, shelter, and/or cover. Any alteration of the vegetative cover affects the animals in the area.

Small herbaceous animals, such as squirrels, mice, moles, and rabbits, would be among the first to show the results of vegetation removal. These small mammals would either be killed or be displaced from the construction areas. However, because the land adjacent to the hatchery site should already be maintaining maximum animal populations, some of the displaced animals may also perish. Of course, this only occurs if there are more animals than the land can maintain. Such animal over-populations would be reduced by predation, starvation, and/or disease.

Insectivores and small carnivores such as shrews, moles, snakes, bats, frogs, lizards, turtles, salamanders, and weasels would also be killed or displaced. These small animals may also exceed the land's carrying capacity, resulting in some losses. Birds, for the most part, would be able to locate substitute feeding areas. Larger animals such as deer, beaver, bobcat, lynx, foxes, and coyote are more wary as well as mobile, and they can usually avoid construction activities and equipment.

However, age is an important factor in the animal's ability to survive construction activities. Young birds that cannot fly would most likely be killed during construction. Likewise, small juvenile mammals remaining in dens could be killed. Eggs of turtles, birds, lizards, and snakes would probably be totally destroyed during hatchery construction. Other animals that are slow or sleeping could also be killed by construction activities. Amphibians, snakes, and lizards, which are slow-moving or torpid during the hot mid-day period, are more susceptible to moving equipment than small mammals. Hibernating or estivating animals would also be highly susceptible. These life forms would be most likely to be killed during construction activities.

As the site becomes revegetated, small mammals, amphibians, reptiles, and birds would reinhabit the area. The establishment of primary vegetation should require about one year for those areas cleared of all vegetation. In three to five years the area should be stabilized. By this time the large trees would be the only habitat that would not be replaced.

(2) Effects of Hatchery Operation on Wildlife

The movement caused by hatchery personnel, tourists, and equipment around the hatchery will influence the behavior of the birds and other animals in the area. If noise and human activity is moderate, some animals such as deer, coyotes, raccoons, and others could return to the area. When tourist visitation is low, a higher wildlife density could be expected in the area. The first generation of small mammals should adjust to the additional noise and movement. However, the use of the area by bird life may be curtailed to some extent. The hatchery's existence would cause a slight change in the number as well as type of animals found in the area. Table 5 is a typical listing of the animals that may be found as related to types of development.

Some animals can become destructive to the hatchery's operations or merely nuisance problems. The Pacific mole is one such animal. The hatcheries would contain some areas of lawn grasses maintained by the hatchery personnel. The Pacific mole would be an animal that may cause damage to these lawn areas. If any moles were to inhabit the lawn areas they would be trapped, then either killed or transferred to an area where they would not be considered destructive. The belted kingfisher, herons, and mergansers also can cause problems. These birds feed on small fish, and if hatchery rearing tanks are not protected, these birds would feed regularly on the hatchery's fingerlings. In the past, predatory birds have been destroyed by hatchery personnel.

Some visitors, especially unsupervised children, may accidentally or deliberately destroy nesting sites and other forms of wildlife habitat near the hatchery. In addition, some animals would be removed from the area as pets. Frogs, crayfish, insects, salamanders, snakes, and lizards are most likely to be captured and removed. However, if visitors are properly informed that the area is an animal sanctuary, such wildlife losses can be minimized.

The constructed hatchery facilities would provide additional habitat area for some animals. The hatchery buildings would become nesting sites for starlings, pigeons, and house sparrows. Populations of these birds may increase in the area. The feed storage area would sometimes be inhabited by the house mouse and the Norway rat. Hatchery personnel would make an effort to eliminate these rodents. These two rodents would most likely be introduced into the hatchery area with feed deliveries. They are primarily found in structures used for storage.

TABLE 5 Common Nesting Birds and Resident Mammals

Industrial Development	Residential Area	Formal Park	Wild Growth
BIRDS			
Domestic Pigeon	House Sparrow	House Finch	Magpie
House Sparrow	House Finch	Robin	Crow
Starling	Robin	Western Kingbird	Song Sparrow
	Say's Phoebe	Mourning Dove	Sparrow Hawk
	Western Kingbird	Sparrow Hawk	Pheasant
	Starling	Crow	Quail
		Bullock's Oriole	Eastern Kingbird
		Starling	Bullock's Oriole
			Robin
			Bewick's Wren
			Brewer's Blackbird
			Starling
			Mourning Dove
MAMMALS			
House Mouse	House Mouse	Cottontail	Deer Mouse
Rat		Pocket Gopher	Skunk
		Deer Mouse	Raccoon
		Ground Squirrel	Mink
			Cottontail
			Shrew
			Mountain Vole
			Weasel
			Ground Squirrel

Source: See reference 35.

(3) Effect of Wildlife Habitat Development

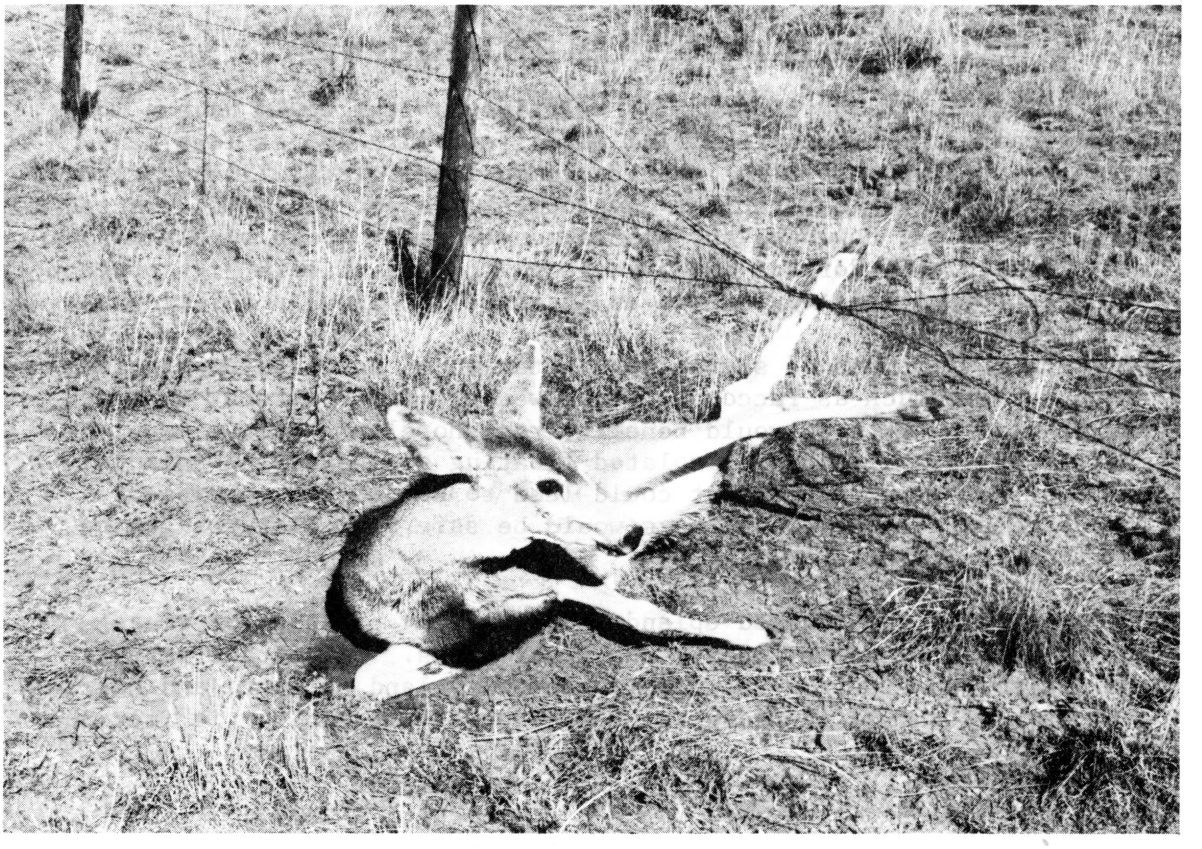
The development of wildlife habitat would have a most significant impact on terrestrial wildlife. With proper land management, it is possible to increase communities of wildlife near the four-dam complex. The habitat development project would be directed at game species; however, any habitat development would supply many additional niches for non-game species. The use of both high project and off-project land would mean an increase in animal populations.

The development of shoreline habitat would increase populations of furbearers such as raccoons, mink, weasel, river otters, muskrat, and beaver. Waterfowl would benefit from shoreland habitat development. The installation of isolated floating goose-nesting islands adjacent to shoreland habitat could lead to successful rearing of Canada geese goslings. The eggs would be safe from disturbances on the floating islands.

Developed and managed uplands could supply habitat for ring-necked pheasant, valley quail, and other birds. Cottontail rabbits would also benefit from the development of upland habitat, and non-game species should increase in population as the habitat is increased.

Deer population would also benefit by the development of upland game bird habitat. The fencing of the habitat lands to prevent overgrazing by cattle would be both beneficial and also prove hazardous to deer. Deer occasionally become hopelessly entwined in some types of barbed wire fencing.

The selection of the types of plants and the game species that would be established directs the increases in non-game species. The major factor is the development of the primary productivity of the land.



Leaping deer sometimes become entangled in the top two strands of barbed wire fencing as has the doe mule deer shown here.

8. Threatened Species of Wildlife

(1) Effects of Hatchery Development

Seventeen threatened species of wildlife may inhabit the project area. As the Corps establishes the hatchery sites, wildlife surveys at the sites would provide information on threatened species at each site. If hatchery construction would disturb a seriously threatened species, the Corps would consider an alternative site for the hatchery. However, all hatcheries would be designed to minimize their impact on the environment. Serious disturbance to threatened wildlife can be avoided with proper safeguards.

Section 7 of Public Law 93-205, the Endangered Species Act of 1973, provides that "all other Federal departments and agencies shall, in consultation with and with the assistance of the Secretary (of Interior), utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to Section 4 of this Act and by taking such action necessary to insure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of such endangered species and threatened species or result in the destruction or modification of habitat of such species which is determined by the Secretary, after consultation as appropriate with the affected States, to be critical."

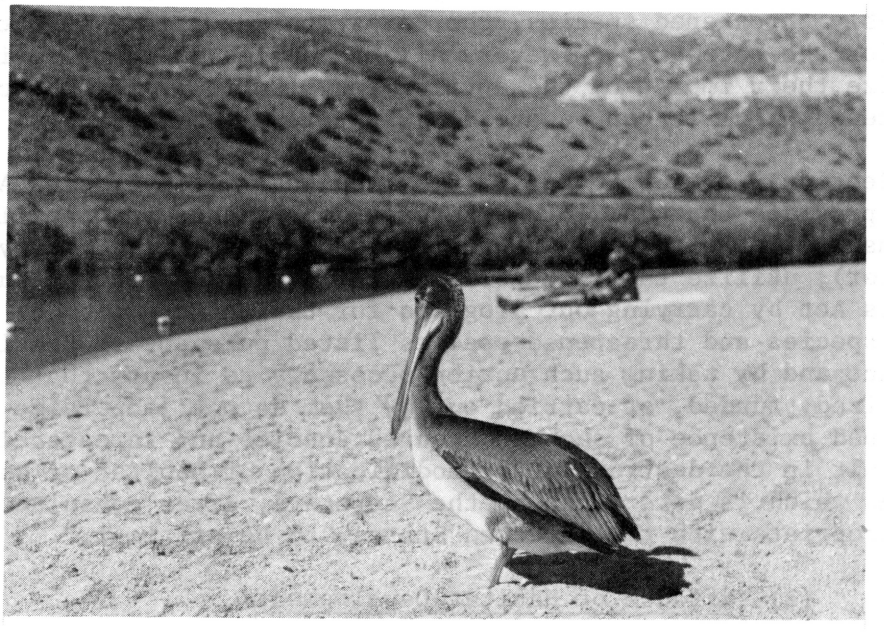
(2) Effects of Habitat Development

The development of wildlife habitat could enhance the threatened situation of the Aleutian Canada goose and the American peregrine falcon. Although the Aleutian Canada goose does not usually breed within the lower Snake River area, it is not unlikely that it would rest during its migration at the shoreline habitat.

The American peregrine falcon has been known to breed within the region. Habitat development might enhance the falcon status because of the increase in waterfowl production as well as overall numbers using the shoreline habitat. The American peregrine falcon preys on ducks and other birds. Increased populations of pheasants and chukar may also contribute to the falcon's survival.

The lower Snake River region may contain as many as 17 species of threatened wildlife, 14 bird species, and 3 species of threatened mammals. The wildlife habitat development program would not directly influence the mammals. However, it might prove beneficial to these birds: the Tule white-fronted goose, prairie falcon, American osprey, western snowy plover, Ferruginous hawk, Columbia sharp-tailed grouse,

northern long-billed curlew, western burrowing owl, and the Yakutat fox sparrow. If these birds occur at a wildlife habitat development, they might benefit through either increased food production or habitat availability.



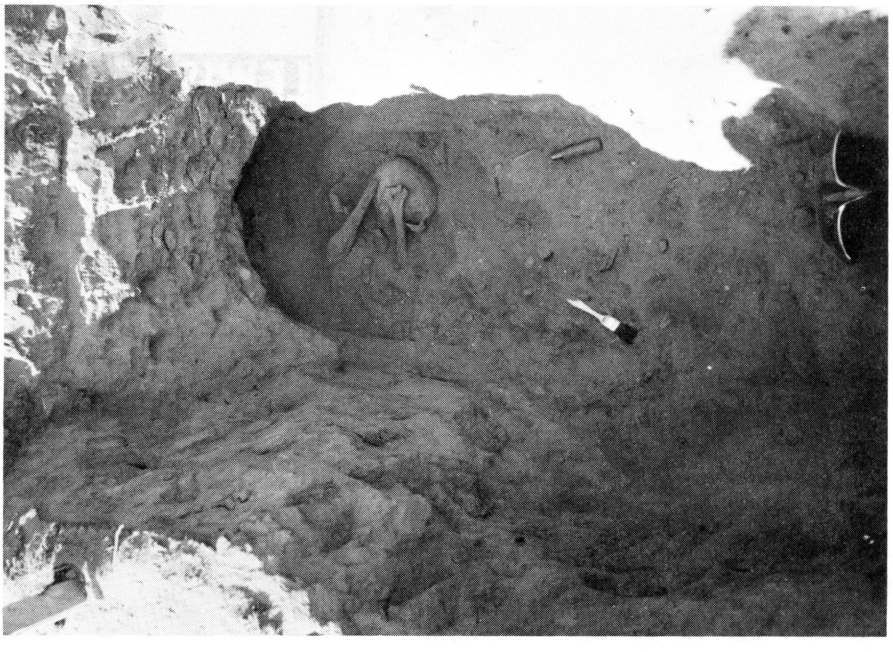
California Brown Pelican

9. Archaeology

Public Law 93-291, the Archaeological Conservation Act of 1974, requires an archaeological investigation at hatchery sites before construction begins. This procedure would prevent damage to most archaeological artifacts and/or fossils; however, during hatchery construction, workers may uncover archaeological artifacts and/or fossils. If such archaeological items are discovered, construction personnel would contact the appropriate authorities, and they would wait for an authorized expert to evaluate the site before continuing work in the area. However, before discovery, some items of archaeological interest may unavoidably be destroyed or damaged by construction activities. Any such newly discovered artifacts and fossils could add to our understanding of early man and his culture.

Hatchery operation should not cause any direct impact on the archaeological potential of an area. It is unlikely that visitors would cause significant damage to an area of average archaeological potential. However, visitors to established archaeological sites can cause severe damage to artifacts and fossils by attempting to collect souvenirs. Thus, hatcheries would be sited to avoid possible destruction or disturbances of known archaeological sites. If valuable archaeological items were uncovered during construction, and the hatchery could not be relocated, the archaeological site would be salvaged or protected. While archaeologists are investigating the site, visitors would be prohibited from entering the sensitive area. However, after the site has been completely investigated, it could be incorporated into a visitors' interest point with displays explaining early man's lifestyle as well as archaeological recovery procedures used at the site.

The shoreline wildlife habitat development may uncover some items of archaeological interest. A similar procedure would be used to unearth the artifacts and/or fossils, as noted above for hatchery construction. However, the land would eventually be developed into wildlife habitat, and no educational display could be established at the site.

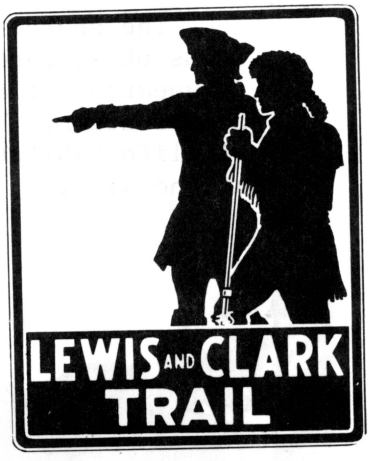


Archaeological Recovery Site

10. National Historic Sites

Hatchery development would not significantly affect any National Historic Site. During hatchery construction and operation, the proposed compensation effort could affect the highway traffic loads around historic sites. During construction the movement of equipment over a nearby highway could create dust, affecting the air quality of the historical site. People heading for fishing areas or hatcheries may visit some of the historic sites during their trip.

Development of wildlife habitat would not directly affect National Historic Sites. Increased wildlife populations could add to the enjoyment of visitations at the historical sites because of the possibility of sighting wildlife on the grounds. Hunters may stop at some of the historical sites during hunting excursions. Traffic on highways leading to historical sites would increase.



11. Socioeconomics

The program of hatchery development may cause an influx of construction workers into parts of the region. Some construction workers may temporarily move their families into the area. This would result in the temporary increase of service requirements of local government and/or public facilities; i.e., schools, hospitals, public health services, police department, sanitation, and others. The hatchery would provide a recreational and educational opportunity to local residents, and the fish produced at the hatchery would also provide recreational opportunities.

The actual construction of the hatchery would result in an economic stimulus to nearby local communities. Construction workers would spend much of their incomes at local retailers. If contractors use local labor exclusively, it would still stimulate the local economy through increased employment. The materials necessary for construction would be primarily drawn from local and regional suppliers. Capital cost estimates for the entire fishery complex are $42,250,000. Annual operation, maintenance, and replacement estimates are close to $2,950,000. Table 6 shows estimates for mitigation.

The annual value of the commercial anadromous fishery from the project is $4,071,320. The value of the sport fishery for both anadromous and residential species from the project is $5,787,000 annually. The commercial fishery will harvest approximately 4,260,000 pounds of anadromous fish per year, while the sport fishery will harvest 1,966,100 pounds of project-raised anadromous fish. The commercial harvest will comprise an estimated 68 percent of the harvest (by weight).

Current information on the justification indicates that the hatcheries have a benefit-cost ratio as follows: fall chinook, 2.14:1; spring and summer chinook, 3.55:1; steelhead, plus fishing access, 1.25:1; and the trout hatchery, 2.29:1.

The basic land use of the lands on which easements are obtained would not be changed. The lands would remain in their present ownership and be subject to a new tax structure. The selling of a property right can reduce the assessed value of the encumbered property, depending on the easement. The Corps believes that in most cases the land use will not be significantly affected; therefore the easements should not significantly affect the tax base. The owners would be paid a reasonable and agreed-upon amount of money for the privilege of sportsman access. Taxes on lands transferred to the Washington State Department of Game in fee would be paid by the Department or, if the county preferred, they would receive one-half of the violation fees obtained in that county. The acres obtained by the Corps in fee may be removed from the tax base. If land is obtained through condemnation, landowners forced to sell would feel a personal loss, especially concerning inherited land.

Benefit-Cost analyses of the hatcheries are as follows:

Fall Chinook

Item	100-Year Life
Initial Construction Cost	$ 6,200,000
Annual Costs	
Interest and Amortization, 5-7/8 percent	$ 365,495
Operation and Maintenance	450,000
Total	$ 815,459
Annual Benefits	
Commercial Fishery Value 934,000 lbs. @ $0.99 per lb.	$ 924,660
Sport Fishery Value 91,500 angler days @ $9.00 per day	823,500
Total	$ 1,748,160
Benefit-Cost Ratio	2.14:1

Spring and Summer Chinook

Item	100-Year Life
Initial Construction Cost	$11,500,000
Annual Costs	
Interest and Amortization, 5-7/8 percent	$ 677,867
Operation and Maintenance	900,000
Total	$ 1,577,867
Annual Benefits	
Commercial Fishery Value 2,994,000 lbs. @ $0.99 per lb.	$ 2,964,060
Sport Fishery Value 293,000 angler days @ $9.00 per day	2,637,000
Total	$ 5,601,060
Benefit-Cost Ratio	3.55:1

Trout Hatchery

Item	100-Year Life
Initial Construction Cost	$ 3,000,000
Annual Costs	
Interest and Amortization, 5-7/8 percent	$ 165,800
Operation and Maintenance	100,000
Total	$ 265,800
Annual Benefits	
Sport Fishery Value	
67,500 angler days @ $9.00 per day	$ 607,500
Benefit-Cost Ratio	2.29:1

Steelhead Including Fishing Access

Item	100-Year Life
Initial Cost	
Steelhead Hatchery	$20,500,000
Sport Fisherman Access Lands	1,050,000
Total	$21,550,000
Annual Costs	
Interest and Amortization, 5-7/8 percent	$ 1,270,265
Operation and Maintenance	1,510,000
Total	$ 2,780,265
Annual Benefits	
Commercial Fishery Value	
332,000 lbs. @ $0.55/pound	$ 182,600
Sport Fishery Value	
Outside Project Area - 236,000 angler-days @ $9.00/day	2,124,000
Acquired Access Lands - 130,000 angler-days @ $9.00/day	1,170,000
Total	$ 3,476,600
Benefit-Cost Ratio	1.25:1

Streambank Fishing

The wildlife habitat development program would require about $458,302 per year over the 100-year life. Below is a partial breakdown of the costs and benefits associated with the wildlife compensation plan.

Wildlife Habitat Development

	100-Year Life
Initial Cost, Lands and Development	
Annual Costs	$6,138,000
Interest and Amortization, 5-7/8 percent	361,804
Operation and Maintenance	121,000
Total	$ 482,804
Annual Benefits	
Big Game Hunting Values	
9,900 hunter-days at $9.00 per day	$ 89,100
Upland Game Hunting Value	
28,500 hunter-days at $9.00 per day	256,500
Waterfowl Hunting Value	
1,000 hunter-days at $9.00 per day	9,000
Appreciation Use	
43,500 user-days at $2.25 per day	97,895
	$ 452,459
Benefit-Cost Ratio	0.94:1

TABLE 6

SUMMARY OF FACILITIES AND COSTS OF FISHERY COMPENSATION FACILITIES
LOWER SNAKE RIVER PROJECT

Facility	Land Requirement	Cost	
		Construction	Annual O&M
Fall Chinook Hatchery 101,800 pounds smolt production	40 acres	$ 6,200,000	$ 450,000
Spring and Summer Chinook Hatcheries 450,000 pounds smolt production	80 acres	$11,500,000	$ 900,000
Steelhead Trout Hatcheries 1,377,500 pounds smolt production	80 acres	$20,500,000	$ 1,500,000
Rainbow Trout Hatchery 93,000 pound capacity	10 acres	$ 3,000,000	$ 100,000
Streambank Lands for Fisherman Access and Development	750 acres	$ 1,050,000	$ 10,000 1/
TOTAL FEDERAL COST	960 acres	$42,250,000	$ 2,950,000

NOTE: a. Hatchery costs are based on actual recent experience at Dworshak, Spring Creek and Bonneville Hatcheries.

b. Land costs are based on knowledge of local land costs achieved by recent experience.

c. Hatchery costs include necessary trapping facilities.

d. Hatchery costs include necessary land @ $1,000 per acre.

1/ Performance of and budgeting for operation and maintenance will be a state responsibility

The breakdown only estimates the value of non-game wildlife. Naturalists and others spend considerable amounts of time and money to photograph and/or enjoy wildlife in a natural setting. There is little data available on non-game appreciation use. Sports such as backpacking, canoeing, and camping are on the increase. People enjoy spending time in a natural setting.

An article which further discusses the types of socioeconomic considerations is included as Appendix H. Although the article focuses on Wyoming, the major points noted are considered to be appropriate to the Snake River region, even though the numbers cited are not.

12. Recreation

The proposed hatchery construction should not create significant effects on recreational sites within the project area. Construction vehicles may increase the traffic load on highways serving recreational sites. The movement of equipment and construction materials on highways leading to the hatchery site and at the hatchery site would probably create dust. This dust could affect recreational areas near highways leading to the hatchery site or near the hatchery. Hatchery constructon may result in increased turbidity and alter the color of nearby stream waters. These changes could affect water quality at downstream recreational areas. A reduction in water quality could influence the use of the water for water-related recreation; i.e., swimming, diving, fishing, water-skiing, boating, and others.

Hatchery operation would result in some changes in man-use, highway traffic loads, and maintenance. Most of the Government-controlled recreational sites (excluding skiing) within the project area (86%) are located on Federally controlled lands. The results of fishery compensation efforts would affect the recreation sites nearest streams which would receive additional fish.

Of those sites, the ones most likely to be affected by compensation efforts are: Washington - Little Butte, Field Spring, Lewis and Clark Trail; Oregon - Mosier Spring, Bear Canyon, Hilgard Junction, Blackhorse, Imnaha River, Cloverdale, Evergreen, Indian Crossing, and Lick Creek; Idaho - Helmer, Castle Creek, South Fork Clearwater, North Fork Slate Creek, Allison Creek, and Seven Devils. These recreational sites would experience increased use by fisherman. Maximum use of these recreational sites could be expected at the beginning of the fishing season. Rapid increases in use could also be expected when anadromous fish runs move up nearby streams. Some overcrowding of streambanks may occur near access points.

The former Idaho State record steelhead was caught in the now inundated portion of the North Fork Clearwater. The fish weighed 29 lbs. 8 oz. The new record is a Dworshak Hatchery fish caught in 1973.

During periods of maximum use there would be associated problems of increased highway traffic, increased noise, and increased sanitation requirements. Additional maintenance would probably be required as overall man-use loads increase.

The wildlife compensation plan is designed to provide 9,900 big game hunter-days, 28,500 upland game hunter-days, and 1,000 waterfowl hunter-days.

The development of the habitat for game species would add to the production of non-game species as well. Birdwatchers, backpackers, hikers, and other naturalists would enjoy the wildlife habitat areas. The habitat area would offer some unique collection of wildlife species that the surrounding vegetation could not offer. An estimated 43,500 user-days of birdwatching, photography, and other naturalist activities could occur at the wildlife habitat areas. The following table shows the extent of the needed habitat compensation.

Table 7. Average Annual Wildlife User-Days, Lower Snake River Project, Washington State

	Without Project (Man-Days)	With Project (Man-Days)	Difference (Requiring Compensation)
Hunting Use 1/ (Big Game, Upland Game, Waterfowl)	57,600	18,200	39,400
Appreciative Use 2/ (Game and Non-Game Species)	63,600	20,100	43,500
Fur Animal	4,200 (pelts)	2,100 (pelts)	2,100 (pelts)

1/ From BSFW & NMFS Report (Reference 19).

2/ From the Washington Department of Game, 1974 Use Figure; appreciative use is increasing at an average rate of 4.4 man-days per year in proportion to every 100 man days of hunting use in Washington.

Hunting and fishing are popular pastimes that draw thousands of people to the Snake River. These sportsmen spend a lot of money in the region in the name of their favorite pastime.

Often the particular hunter or fisherman not only reaps the benefits of his consumptive sport, but intertwines a share of nonconsumptive wildlife use during a day on the Snake. These nonconsumptive uses are manifested in photographs of wildlife or entries in a birdwatcher's field notes. With most people, though, the simple sighting of wildlife and associated pleasure is the reward.

The proposed compensation would re-establish the opportunities to enjoy and use wildlife in these various forms. The goal, as far as steelhead angling is concerned, is to replace 130,000 angler-days per year in the lower Snake River.

The angling for resident fish is schedule for a boost of 67,500 angler-days per year over the existing use. This figure takes into account a differential included in the 1972 BSFW and NMFS Report which states that two stream days are equal to three reservoir angler-days.

Lost hunting days would be compensated by providing an opportunity for 28,500 hunting-days for upland birds; 9,900 hunting-days for big game; and 1,000 hunting-days for waterfowl.

Appreciative use (non-consumptive use of wildlife and its surroundings which is shared by hunters, fishermen, and non-hunters or non-fishermen alike) would be replaced to an estimated 43,500 man-days.

The assumption is that these days are in addition to those now taking place. The addition of these user days to the present situation would have people-related impacts such as littering, vandalism, fire hazard, and relative crowding.

The proposed action would have its greatest impact upon the management of fishery and wildlife resources and on the availability of outdoor hunting and fishing opportunities. The intent of the action is to replace resources that have been lost as a result of construction of the Lower Snake River Project; consequently, the environmental impact is largely beneficial.

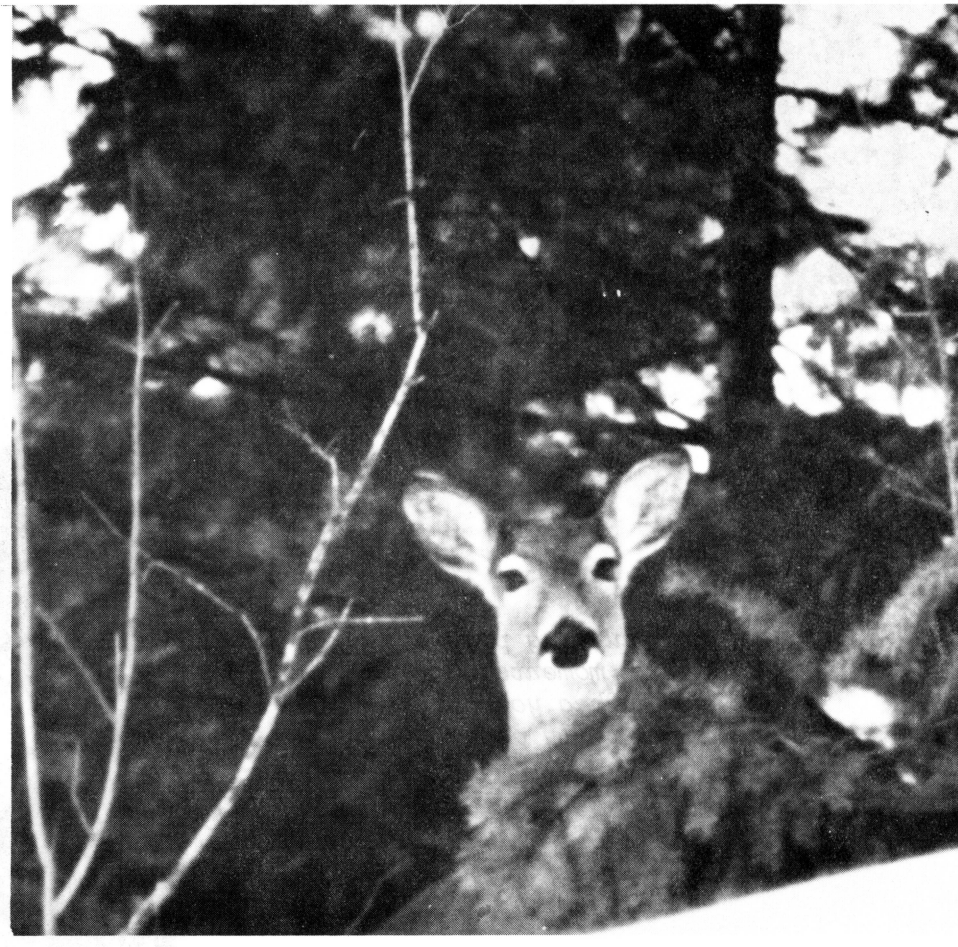
Some potential exists for adverse impacts upon areas which have not previously received much use from the public. Basically, litter control and vandalism may become more of a problem in areas presently unavailable to the public. However, if current practices are followed, game department personnel can and would help landowners who enter into sportsmen access easement agreements in controlling this type of problem. One of the real advantages of the easement approach is that it enables game department personnel to help in the control of the small percentage of hunters and fishermen who abuse both the rights of the public and the individual landowners because most hunters would use the easement lands.

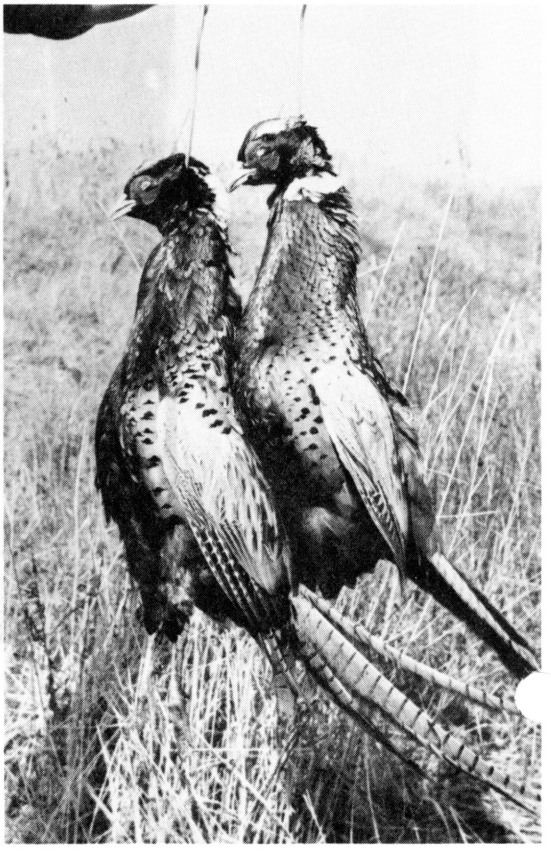
Major values of the proposed land acquisition program center around making available land managed for production of wildlife. The availability of such land is becoming more important as our national population grows. It can also be looked on in the perspective of spreading out existing fishing and hunting pressure by making more areas available for use. Although this is tempered somewhat by the fact that areas have been lost due to project construction, it is probably true that areas acquired through easement acquisition and purchase would be managed more intensively than those lands that were lost. Indeed, if compensation is to be achieved, more intensive management of less area would need to be accomplished.

Although management of fish and wildlife resources is oriented toward providing sport for fishermen and hunters, an inseparable part of the equation lies in providing for the general well being of the species. It is a known fact that species management for hunting and fishing purposes has led to the preservation and continued well being of several species. The active management of areas to be acquired as part of the proposed compensation plan would play a part in the maintenance of game species considered to be of importance to a large segment of the population.

One of the major side values of management for game animals is that habitat development and protection aids a wide variety of species, many of which are not game animals. In the present report there is no specific plan for compensation for non-game species that have been affected by project construction; however, habitat development for the game species would have definite values for other members of the wildlife community.

Big game hunting challenges a hunter's ability to overcome the elements and outwit his prey.





Gamebird hunting provides explosive moments; you either bag your prey or watch it fly away.

13. Esthetics

From clearing until revegetation the hatchery site would disturb the visual harmony of the surrounding landscape. Proper hatchery design would minimize the impact on the natural beauty. Landscape architects would design the hatchery surroundings to blend with the natural setting. Hatchery plans would require revegetation of most cleared areas with indigenous plants. However, the hatcheries would alter the plant communities on some parts of their sites, and the hatchery buildings and other structures would remain in the area for the life of the project.

Hatchery operation would have only minor effects on the esthetics. The movement of hatchery equipment would disturb the natural setting of the site, but other hatchery operations would not cause disturbances.

The trees, shrubs, and wildflowers of the wildlife habitat development program would provide a pleasing natural setting. Such quiet green areas have a relaxing influence on visitors. Added pleasure could occur from the sighting of various wildlife. Many people enjoy visiting natural areas to take photographs of waterfowl and other interesting wildlife. Non-game as well as game species are enjoyable to such visitors. Wildlife habitat areas would provide a variety of such esthetic pleasures.

From a non-hunter point of view, the program for wildlife habitat development offers increased opportunity for viewing of birds and animals. This may serve a variety of interests, from the casual chance sighting to serious nature photography.

While some of the habitat plantings of grain and hay may be somewhat artificial in appearance, the random shrub and tree plantings would again provide "riparian" growth. This would add greenery to the canyon setting and improve the overall esthetic atmosphere.

V UNAVOIDABLE ADVERSE IMPACTS

During the construction phase of the proposed hatcheries, heavy machinery working in or near the water and runoff from excavations and exposed soils can be expected to increase the turbidity and silt loads of nearby waters. The greatest increase would probably occur when the water intake is constructed. It may be that some fill would be placed on the edge of the river or that a part of a stream will have to be diverted with a cofferdam. Increases in the silt load in the river will have several deleterious effects on aquatic biota. Reduced light penetration will reduce primary productivity (plant growth) in the stream. The silt could smother some bottom organisms.

The construction phase of each of the hatcheries is expected to have only a small permanent adverse impact on the environment. As construction is completed, siltation will cease. Construction activities at the hatchery would result in some noise and air pollution. Construction would also eliminate some wildlife habitat.

During the operational phase of the hatcheries, wastewater leaving the hatchery-rearing facilities will cause increases in the nutrient level as well as the level of solids and the BOD in the receiving waters. Although elevated nutrient levels are expected to enhance primary production in the river immediately downstream from the hatchery, this should not have any significant effect on the odor or taste of the water. Wastewater leaving the hatchery would also contain dilute quantities of drug residues used in fish cultural operations. The exposure of resident fish species and the stream organisms to these residues is not expected to be a problem.

The increased human activity in the hatchery areas would have some adverse effect on wildlife.

Primarily, the increase in human use of areas for hunting and fishing would probably lead to increased problems with litter and vandalism which would not be completely preventable. Increased use of these areas would also lead to trampling of vegetation in the easement and acquisition areas, although the magnitude of this

will not be great. Increased harvest of game animals and sport fish would occur, but due to increased management of wildlife and fish populations, the sport species populations should not decline as a result of the harvest.

The acquisition of lands in fee may remove these lands from the local property tax process. The Washington State Department of Game would pay either property taxes on their lands or supply the county with one-half of the fines collected in the county for game violations.

The acquisition of lands (easement or fee) for wildlife habitat and hunting or streambank fishing access would be on a willing seller and/or condemnation basis. If condemned, the landowners required to sell probably would feel a personal loss, especially concerning inherited land.

Hunters traveling to the habitat development sites may increase traffic on local highways.

Some of the development operations (such as field plowing, pump construction) would damage local areas of existing vegetation and disturb wildlife now in the area. The development would also create dust and noise. All of the adverse impacts related to the construction activities would be temporary.

Littering

VI ALTERNATIVES

This discussion of alternatives is basically divided into three general categories:

a. No Action would let the present condition continue with no mitigation. With this the Corps of Engineers would continue to provide multiple purpose management for the existing project lands, and would continue to operate the fish passage facilities. The proposed program of a much larger scope would not be undertaken.

b. Removal of the Dams is a conceptual alternative which would eventually allow the river canyon to return to somewhat near its former state. The practicality of such an alternative is open to question.

c. Compensation or Management Alternatives include a wide range of alternative possibilities for either fish or wildlife. This would include implementing only part of the list of items from the proposed compensation program, as well as a number of differing items or management variations.

Each of the three general categories of alternatives is further discussed on the following pages.

a. No Action.

One alternative is to let the present situation continue without compensation. This no-action alternative would eliminate the adverse environmental effects associated with the compensation activities. Conversely, it would eliminate the expected benefits associated with the compensation measures and therefore the adverse impacts to fish and wildlife resources occasioned by Lower Snake River dam construction would remain.

The no-action alternative would release energy, manpower, funds, and material that otherwise would be used for hatchery construction and operation to other uses. Pollution produced during the construction and operation of the hatcheries would

not occur. Disruption or alterations of local ecosystems* would not result from the construction and operation of hatcheries. Hatchery-reared fish would not compete with the wild type for the available food supply.

However, the no-action alternative would not increase the population of fish species to the levels estimated to be normal. Fish survival would not increase and may continue to decline. This high-protein food measure (salmon and steelhead fishery) would be limited to the natural variations of abundance, decreased by the losses resulting from passing through the dams. Similarly, the number of fish available to the sport fishery would also follow such variations.

The no-action alternative would not increase the population of game and non-game species to their previous levels estimated to be normal, therefore the full human use of the region's wildlife potential would not be realized.

b. Dam Removal.

The removal of the dams would gradually result in the return of fish runs to previous levels. Removal of the dams would result in a current loss of $65 million of electrical power which would increase to $89 million with completion of the initial 3 generating units at Lower Granite Dam. This loss would be even greater after the installation of three additional generating units in each of the 4 Lower Snake River Dam powerhouses. Navigation benefits would also be lost from the area.

Removal of these dams would mean the loss of a major portion of the investment still remaining to accrue over the project life. To maintain the present status of production as well as the standard of living for the region's citizens, the electrical power production would have to be supplied by alternative sources. If not, removal of the dam would result in lost production in both agriculture and manufacturing, and part of the regional populace would have to either reduce their standard of living or relocate.

c. Compensation or Management Alternatives.

Plans for alteration of the dams are underway. Such dam alteration could also aid the fish runs by negating several adverse

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* A community and its (living and non-living) environment considered collectively; the fundamental unit of ecology. It may be quite small, as the ecosystem of one-celled plants in a drop of water, or indefinitely large, as in the grassland ecosystem.

effects. Two methods for reducing adverse effects are traveling screens and flip lips.

A method of reducing the fishery loss is to place traveling screens in all dams which would divert the smolts into a system for bypassing the turbines for return to the river below each dam or to place traveling screens at strategic upstream dams, such as Lower Granite Dam, and then capture the smolts in the bypass system, transport them by tanker truck downstream to Bonneville Dam, and release them. This method requires the use of trucks and personnel. Pilot studies are currently being carried out by the National Marine Fisheries Service to determine the effectiveness of the program. This method eliminates most of the hazards of dam passage for migratory smolts.

(1) Traveling screens direct downstream migrating salmonids away from the turbine. Fish enter the turbine intake gatewells and eventually move through the fingerling bypass system to the tailrace. In 1970, the U.S. Bureau of Commercial Fisheries (now the National Marine Fisheries Service) published a study on fingerling bypass systems for low-head dams (see Reference 16). This study indicated that the traveling screens with modifications could direct possibly many of the fish away from the turbines. Steelhead smolt were not as easily directed through the bypass system. (See Plate 11.)

In a recent report entitled, Snake River Runs of Salmon and Steelhead Trout: Collection and Transportation Experiments at Little Goose Dam, 1971-74, prepared by the National Marine Fisheries Service, it was indicated that sufficient data exist to recommend mass transport of steelhead from Little Goose Dam. Chinook salmon would need additional study before implementing a transport program. It does appear from the report that dam bypass by truck transportation is one method of possibly insuring steelhead survival. In 1975, the Corps is funding a program to haul approximately 40 percent of the steelhead around the dams.

(2) Flip lips are additions to the spillway of the dam. They are designed to direct waters in a horizontal direction over the upper surface of the stilling basin. This redirection of water significantly reduces the occurrence of nitrogen supersaturation during average flow years. Nitrogen supersaturation results when air is entrained in the water that falls over the apron into the deeper portions of the stilling basin. The flip lips should reduce the number of fish lost to predation or disease as a result of nitrogen embolism. The Corps plans to put flip lips on the spillways of all the Lower Snake River dams.

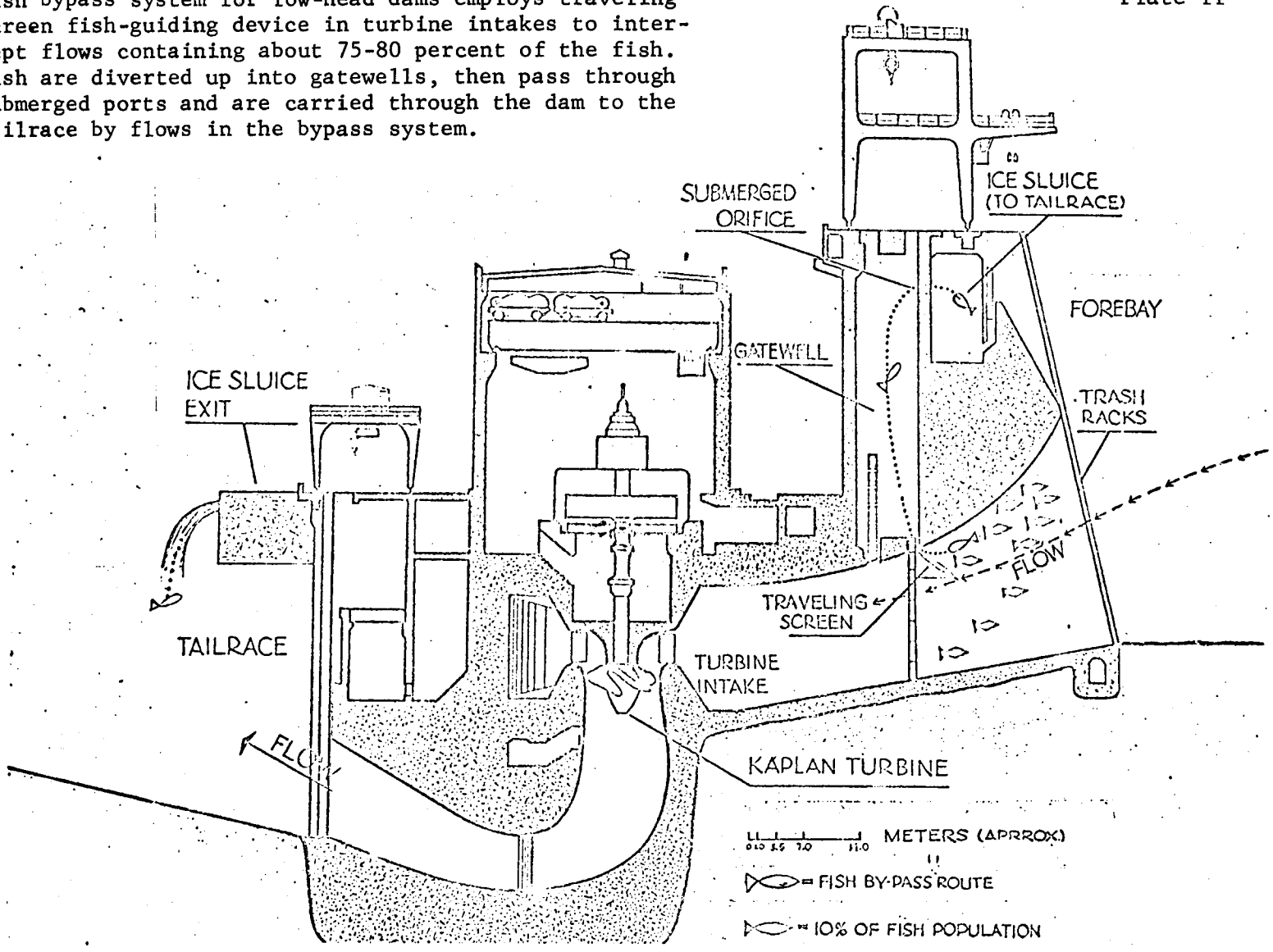
Fish Hauling Transport

(3) The Corps could locate new hatcheries nearer the mouth of the Columbia River. This would be a more efficient operation from the standpoint of obtaining adult spawning stock and reducing project-caused losses to both adult and juvenile fish. It would not, however, replace the loss in the upper river area where it occurred, nor would the fish be available to the sport, commercial, or Indian fishery from which they had been lost. Moreover, the increased density of salmonid fish holding in the Lower Columbia may result in higher incidence of disease, and the salmonid's contributions to the ecological balance of the Snake River and Tributaries would be greatly eliminated.

AFTER THE TRAVELING SCREEN HAS BEEN LOWERED INTO THE TURBINE INTAKE 100 FEET BELOW THE DECK, HYDRAULIC PISTONS PUSH THE SCREEN INTO POSITION FOR GUIDING FISH. A HYDRAULIC DRIVE SYSTEM MOVES THE SCREEN, A STANDARD BALANCED -SPIRAL - WEAVE USED BY INDUSTRY FOR CONVEYORS

Plate 11

Fish bypass system for low-head dams employs traveling-screen fish-guiding device in turbine intakes to intercept flows containing about 75-80 percent of the fish. Fish are diverted up into gatewells, then pass through submerged ports and are carried through the dam to the tailrace by flows in the bypass system.



Management Methods

a. Fish Management.

Another method of returning the fish population to higher numbers is to alter the present fish management program. Reducing the commercial and sport fishermens' harvest will increase the number of returning fish. Regulating agencies can reduce to a greater extent the already limited harvest; however, past reductions have not stopped the declining trend in the anadromous fishery. Summer chinook have little to no harvest, but they have continued to decline.

Many Indian tribes also have fishing rights to the Columbia River and/or its tributaries. Indian treaty rights concerning fishing are an important aspect of fishery management. The jurisdiction of state regulating agencies to manage the Indian fishery is currently under litigation. Management programs must consider the effect of the Indian harvest on the anadromous fishery.

The restriction of the fishery harvest would reduce the number of fish available as food in the region. As a regional activity, restricting the fish harvest could reduce the number of mandays spent on sport fishing. Likewise, a proportionate drop in the amount of tourist-based income to the region may occur. Some commercial fishermen may have to find other livelihoods.

b. Expansion of Existing Hatcheries.

With expansion and increased production, existing fish hatcheries may fulfill some of the proposed compensation efforts regarding

additional fish production. From available information, there are ten hatcheries within the general region. Table 8 lists these hatcheries. Six hatcheries involve trout culture (including steelhead), six involve chinook salmon culture, and one involves coho salmon culture. Some hatcheries breed more than one type of fish.

Some of the existing hatcheries may be unusable for expansion. However, there is a possibility that some of the hatcheries, by expansion, may contribute to the compensation program.

TABLE 8

Existing Hatcheries Within the Project Area

IDAHO

1. Decker Flat Rearing Pond.
   a. Location: Stanley, Idaho: Idaho Fish and Game Department.
   b. Species: Chinook salmon.
   c. Capacity: Unknown.

2. Dworshak National Fish Hatchery.
   a. Location: Ahsahka, Idaho: U.S. Fish and Wildlife Service.
   b. Species: Steelhead, Kokanee, Rainbow, Cutthroat.
   c. Capacity: 3.36 million Steelhead smolt; 192,000 Rainbow @ 3/lb; 1 million Rainbow @ 1,000/lb; 1 million Rainbow @ 100/lb; 100,000 Cutthroat @ 20/lb; and 4 million Kokanee @ 800/lb.

3. Kooskia National Fish Hatchery.
   a. Location: Kooskia, Idaho: U.S. Fish and Wildlife Service.
   b. Species: Spring Chinook, Steelhead.
   c. Capacity: 177,070 Chinook; 215,625 Steelhead.

4. Niagara Spring Hatchery.
   a. Location: Snake River, Hagerman Valley, Idaho Fish and Game Department.
   b. Species: Steelhead.
   c. Capacity: 3.3 million eggs, 1.6 million smolt.

5. Oxbow Salmon Hatchery.
   a. Location: Snake River, below Oxbow Dam: Idaho Fish and Game Department.
   b. Species: Fall Chinook.
   c. Capacity: 5 million eggs, 600,000 rearing, 60-day-release fingerling.

TABLE 8 (Continued)

IDAHO (Cont'd)

6. Rapid River Hatchery.
   a. Location: Rapid River, six miles south of Riggins, Idaho.
   b. Species: Spring Chinook.
   c. Capacity: 600,000 Spring Chinook to migrant size.

7. Sweetwater Eyeing Station.
   a. Location: Sweetwater Creek, 21 miles south of Lewiston, Idaho: Idaho Fish and Game Department.
   b. Species: Chinook, Steelhead.
   c. Capacity: 1,250,000 eggs.

OREGON

Wallowa Fish Hatchery.
   a. Location: Enterprise, Oregon: Oregon State Wildlife Commission.
   b. Species: Rainbow.
   c. Capacity: Unknown.

WASHINGTON

1. Tucannon Fish Hatchery.
   a. Location: Tucannon River, about 23 miles south from Pomeroy: Washington State Department of Game.
   b. Species: Rainbow, Eastern brook, German brown, Steelhead.
   c. Capacity: 200,000 Rainbow, Eastern brook, German brown; 50,000 Steelhead.

2. Tucannon Ponds (Russell Springs).
   a. Location: Columbia County, tributary to Tucannon River in Section 16, Township 10N, Range 41E: Washington Department of Fisheries.
   b. Species: Coho and Chinook salmon.
   c. Capacity: Believed inactive.

c. Genetic Alteration of the Fish.

A program could be established to breed salmonid fish with the capability to reproduce in the reservoirs. Fish already using the area will contribute by natural processes of evolution to develop a genetic combination which would enable the species to cope with the stress being produced by dam-induced alteration of the environment. Under natural environmental alteration, change occurs over thousands and even millions of years. This allows for

a natural selection process to gradually adapt fish to the change. The rapid changes in the environment caused by dam construction over a decade or so have not provided adequate time for natural selection to produce suitable anadromous fish for this new environment. Fish culture could be a means to breed strains of fish that will flourish under the conditions of the series of reservoirs. This alternative would be more in the nature of research, rather than a management action at this time.

d. Artificial Spawning or Incubation Channels.

Artificial spawning or egg incubation channels could be built in lieu of a hatchery. Adult fish would be allowed to spawn naturally in these channels or the eggs would be implanted into the gravels. The young fish would then be left to grow and survive under natural conditions with no application of intensive culture or management by man.

Artificial channels have been used for salmon and steelhead but they are not believed to be feasible for rearing rainbow trout. If one or more artificial spawning channels were built in lieu of hatcheries, some other means would have to be found for providing fish for the trout stocking programs.

Construction of channels would require more excavation work than that required for a hatchery. This could result in a higher

deposition of silt and a more severe impact on the associated stream for the short period of construction of the channel.

Fish production from spawning or egg incubation channels can be erratic. Flood condition and accompanying high silt loads can smother eggs and kill young fish. Fish diseases can be a very serious problem, and the total production of many channels has been lost in some years due to diseases.

Large numbers of fish residing in a channel would be releasing solid and liquid metabolic waste products directly into the water. This would enrich the stream more than hatchery effluent (on a per-fish basis) since most of the solids of hatchery effluent would be removed in settling basins.

A spawning channel could be some adverse influence on wildlife if it were to be located where habitat would be removed for construction. Compared to a hatchery site, however, a spawning channel would have less adverse impact. There would be less human activity in the area. Brush and trees may grow along the channel and would provide some habitat.

Substantial amounts of water would have to be used in the channels during the spawning and incubation. This water would probably be diverted from an adjacent stream and it would not be available for other uses during this period. There may be additional land required for channel development.

e. Improve the Warm-water Fishery.

More effort could be undertaken to improve the resident fishery in the four Lower Snake River impoundments. The plan recommended by the fish and wildlife agencies does not include any provisions for improving the spiny-ray (bass, crappie, perch) fishery in the project waters. For example, measures to improve spawning and rearing habitat for warm-water fish could be undertaken. The concept of spiny-ray fishery improvement is very much compatible with the biological conditions of the impoundments. The Corps of Engineers proposes to investigate this alternative more fully prior to proceeding with a trout hatchery for resident fishery compensation.

f. Land Acquisition.

The proposed compensation plan has been formulated in an attempt to provide a balance between compensation for losses occurring in fish and wildlife resources and the effects or concern to private landowners. Basic alternatives for the land acquisition section of the plan revolve around either more or less land acquisition.

Except for the general requirements for hatchery sites, it is not possible at this time to define separable elements of the proposed land acquisition program to allow detailed discussion of the environmental effects of lesser acquisition plans. Generally, though, it is possible to envision some possible impacts of a lesser program. Primarily, these effects would revolve around not replacing both lost outdoor fishing and hunting opportunities and wildlife habitat. Estimates of lost hunter and fisherman days caused by the Lower Snake River Project total approximately 818,000 (see Tables 5 and 7 for a breakdown of this loss). While this does not represent the total loss associated with project construction, it is a measure of one segment of loss that has occurred. By not providing replacement resources to satisfy this type of activity demand, the displaced fish and wildlife oriented people are more heavily using other areas in the region. Loss of quality in hunting and fishing experience can be a result of this crowding. Although recreation development has been and is taking place on the Lower Snake River Project, it is of a different segment of the population.

With a lesser program of land acquisition for wildlife habitat development and easement hunter access, the loss of wildlife and associated wildlife resources probably would not be fully replaced.

Reduced land acquisition for the hatcheries would result in deletion of one or more hatcheries, except as it might be possible to locate or expand hatcheries on existing public land somewhere in the region.

Reduced land acquisition at points along streams for fisherman access would proportionately reduce the amount of public fishing area provided.

Reduced (or no) land acquisition for the fish and wildlife purposes would be responsive to expressed concerns of private landowners and would reduce or avoid changes in local socioeconomic patterns as a result of the proposed compensation plan.

g. Game Bird Production.

There are three methods of meeting the recommended pheasant requirement for upland game bird hunting. One method is to establish a game bird farm. The second method is to purchase the birds for stocking from a commercial farm. The third method is to provide good habitat management to bring pheasant populations back. The construction and operation of a game bird farm is estimated to cost about $360,000 each year over a 20-year operation period compared to a cost of about $5.00 each for purchasing pheasants.

Differing views have been expressed on the desirability of using domestically grown birds for release in the wild to offset hunting demand. Under the proposed plan the Corps would furnish

funds to the Washington Department of Game to provide birds either by purchase, enlarging an existing bird farm, or constructing a new one.

The Corps has studied more, intensive development of wildlife habitat on project land. If possible, this would reduce the amount of off-project land required for compensation of wildlife losses. The amount of developable land remaining along the shoreline has been severely reduced after project construction because of extensive reaches of riprapped railroad and highway relocations and vertical, barren cliffs. Those areas which can be developed are not capable of replacing the amount and kind of habitat and wildlife numbers existing along the open river. Present plans for development of habitat on project lands, as developed by independent consultants, demonstrate the maximum improvements obtainable which are economically feasible.

VII THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Optimum fish populations cannot be maintained under present conditions without implementation of compensation action.

Long-term use of the environment by the hatcheries would increase trout, steelhead, and salmon populations in local waters. An additional 233,000 trout, 18,300 fall chinook, 58,700 spring and summer chinook, and 55,100 summer steelhead would help insure high fish survival.

With construction of the hatcheries, the undisturbed habitat at each local hatchery site would not continue to provide a suitable environment for forms of wildlife indigenous to the area, including deer, foxes, jackrabbits, and other small mammals. However, the trade-off in favor of improved fishery is considered to be the more significant long-term objective.

Long-term use of the environment by the hatcheries would result in an annual discharge of ammonia, BOD, nitrates, phosphates, and solids into the receiving waters. The flora and fauna in the river could be expected to increase up to a level commensurate with the amount of nutrients available in the hatcheries' discharges. Once this level has been achieved, there should be no further increase. The long-term cumulative effects would be an initial increase in primary and secondary productivity in the receiving waters, followed by a static production of aquatic life at this new level.

The hatchery waste would be discharged into receiving waters which ultimately flow into the Columbia River and then the ocean. Salmon and steelhead population would increase in the forage range along the Pacific Coast. Such increases would result in adjustment in the predator-prey relationships of salmon and steelhead in the ocean.

Development of the hatcheries would increase the long-term productivity of the fishery. However, it would also reduce the amount of localized terrestrial production. At the end of their project life, the hatcheries could be removed from the environment.

With the development of the lands proposed for wildlife habitat, the land would provide a suitable environment for many forms of wildlife indigenous to the area, including deer, foxes, jackrabbits, and other species. Optimum wildlife populations cannot be maintained under present conditions without additional habitat. Hunting success along the rivers would not be restored to preproject levels without a development program.

Long-term use of the environment for wildlife habitat would restore pheasant, deer, and other game populations in local areas. The goal is to add 600 goslings, 1,800 deer, 13,400 furbearers, and 120,800 small birds and mammals. Development of wildlife habitat would greatly increase the long-term productivity of the land for wildlife purposes. The habitat area would provide wild game for hunters and study areas for naturalists.

Long-term use of the environment as wildlife habitat would result in the scattered discharge of nutrients to the land and into the local waters. Biological processes related to animal life cycles would occur.

The proposed land acquisition programs are intended to provide for long-term outdoor activities and for wildlife habitat development and preservation. The easement acquisition programs do not impair the primary use of land for agricultural production, while they would provide for replacement of lost outdoor activities. This, in a sense, is an embodiment of the multiple-use concept and, as such, provides a long-term benefit.

Fee title acquisition of the proposed 400 acres of land would probably preclude some commerical agricultural production on that land in favor of wildlife production.

In summary, the commitment of funds for easement and limited fee title acquisition would be a long-term public investment. The proposed program will provide for long-term availability of wildlife and outdoor resources which are generally in decreasing supply.

In the philosophical sense, the construction of hatcheries and game bird farms increases the dependency of the affected species upon the human management operation. In other words, natural processes are forced into a level of survival that is dependent on continued operation by human overt action. In a sense there is merit in devising compensation measures that can eventually become self-sufficient over the long term in order that natural systems do not become so increasingly man dependent. With hatchery operation for fish, it would appear that this goal would not suffice due to the pressures of use and the complexities involved. A goal of self-sufficiency for much of the wildlife habitat is more realistic, and the program of bird stocking is proposed only for a 20-year period until habitat is replaced.

The need for intensive manipulation of the natural systems as proposed in the fish and wildlife compensation program stems from the already high level of human impact caused by construction of the four lower Snake River projects. Establishment of hatcheries and wildlife habitat areas will require long-term commitments of energy, manpower, and money.

VIII ANY IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

The construction and operation of the hatcheries is expected to change the water quality of the receiving waters in that area immediately downstream from the hatchery through the release of wastewater from fish-rearing facilities and detention ponds. An increase in numbers of benthic organisms and algae growth is also expected in this area. This is only considered irreversible to the extent that complete waste treatment may be infeasible. If a "no discharge" program were someday adopted for the hatcheries (such as land disposal by sprinkler irrigation), then the water quality aspect would not be an impact factor. Once the source of stream enrichment is stopped, the level of algae growth and numbers of benthic organisms would decrease to a level dictated by the amount of nutrients occurring naturally in the river.

Modifications of land use patterns by wildlife populations as a result of increased human activities can be expected to occur in each of the local hatchery areas. However, all these effects perhaps could be reversible. If at some time in the future the hatcheries were no longer needed, the structures could be removed and the land regraded to its original contours. Original plant species could be replanted. Wildlife could be expected to use the area again after human activities stopped.

Since the hatchery sites have not been determined and surveyed, it is not known if they would have historical importance. The sites may contain some archaeological interest. Aborigines could have used the sites because they may be at a level-area, near water. Prior to construction of any hatchery, the site would be checked by archaeologists to ascertain archaeological significance. Any archaeological relics salvaged and removed or damaged during construction would be an irreversible impact to the on-site archaeological resources.

Development of the hatchery program would require the commitment of manpower, equipment, construction materials, energy, water, land, and monetary resources. These resources would not be available for any alternative use while needed for the project. Lands required for the anadromous fish hatcheries may be removed from the tax roles.

The irrigation system for waterfowl and game bird habitat areas would use pumps which would be an irreversible use of power. A certain number of seeds and plants would be required for habitat development.

Development of the habitat program would also require the commitment of manpower, equipment, construction materials, energy, water, land, and monetary resources. These resources would not be available for other uses.

There will be no irreversible commitment of environmental resources as a result of the proposed land acquisition. Financial resources will be committed which will not be recoverable in kind, although there will be definite returns in terms of outdoor use. Land use and ownership will change for those lands which may be acquired in fee.

The compensation program in general would not be an irreversible action in that hatchery fish production could be terminated and wildlife habitat areas could be converted to other uses.

IX COORDINATION

The preparation of the report of the Federal fish and wildlife agencies was a coordinated effort between the National Marine Fisheries Service and the U.S. Fish and Wildlife Service. Their work was reviewed by the various State fish and wildlife agencies.

The report, with recommendations of the fish and wildlife agencies, was then incorporated into a draft report by the Walla Walla District, Corps of Engineers. Public meetings were held by the Corps of Engineers to obtain views and comments. The draft report was made available to the public prior to the meetings.

Four meetings were held:

Richland, Washington	22 May 1973
Lewiston, Idaho	24 May 1973
Dayton, Washington	24 July 1973
Colfax, Washington	26 July 1973

A transcript of the public meetings has been prepared and published as a separate volume. Copies of the transcript are available from the Walla Walla District, Corps of Engineers, Building 602, City-County Airport, Walla Walla, Washington.

As a result of the public meetings, several varying views were expressed. Four such views are noted here as being the most commonly heard.

(1) Concurrence with the recommendations of the fish and wildlife agencies' report.

(2) Opposition to acquisition of private lands for wildlife habitat and public access.

(3) Opposition to the "bird farm" concept on the basis of ecological and economic reasons.

(4) Expression that more should be done specifically for non-game species.

Subsequent to the public meetings, two noted fish and wildlife authorities were engaged to review the plans and the comments obtained from the meetings. These men, Dr. Ernest O. Salo (fish) and Dr. W. L. Pengally (wildlife) in general concurred with the recommendations of the fish and wildlife agencies.

Coordination between the Corps of Engineers and the Federal and State fish and wildlife agencies has occurred in review of the consultants' reports. Additional coordination with the Washington Department of Game has also occurred as a result of the views expressed by private landowners in opposition to wildlife and acquisition.

The draft environmental impact statement was made available for review by agencies, organizations, and the public. Letters of comment which were received are included in the back of Appendix A of this statement. Responses to the comments received are also included in Appendix A.

The following agencies, organizations, and private citizens received a copy of the draft environmental impact statement but did not provide comments:

Honorable Warren G. Magnuson
Honorable Daniel J. Evans
Honorable Robert Straub
Honorable Cecil D. Andrus
Honorable Thomas S. Foley
Honorable Charles D. Kilbury
Federal Energy Administration
Regional Federal Highway Administrator
Adams County Commissioners, Washington
Asotin County Commissioners, Washington
Baker County Commissioners, Oregon
Clearwater County Commissioners, Idaho
Custer County Commissioners, Idaho
Franklin County Commissioners, Washington
Garfield County Commissioners, Washington
Gooding County Commissioners, Idaho
Grant County Commissioners, Oregon
Grant County Commissioners, Washington
Idaho County Commissioners, Idaho
Latah County Commissioners, Idaho
Lewis County Commissioners, Idaho
Nez Perce County Commissioners, Idaho
Umatilla County Commissioners, Oregon
Valley County Commissioners,
Walla Walla County Commissioners, Washington

Mr. Alton N. Filan, Waitsburg, Washington
Mr. William B. Garnett, Pullman, Washington
Mr. George and Ms. Dorothea Gault, Colfax, Washington
Mr. Donald W. George, Pullman, Washington
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St. Joe Valley Assoc., Avery, Idaho
Sierra Club, Coeur d'Alene, Idaho
Tri-State Steelheaders, Inc., Walla Walla, Washington
Union County Farm Bureau, Island City, Oregon
Walla Walla County Farm Bureau, Washington
Washington Assoc. of Wheat Growers, Ritzville, Washington
Washington Environmental Council, Seattle, Washington
Whitman County Cattlemen's Assoc., Colfax, Washington
Idaho Environmental Council, Idaho Falls, Idaho
Izaak Walton League of America, Roseburg, Oregon
League of Women Voters of Washington, Seattle, Washington
National Audubon Society, Walla Walla, Washington
National Audubon Society, Kennewick, Washington
National Audubon Society, Seattle, Washington
National Wildlife Federation, Portland, Oregon
Native American Rights Fund, Boulder, Colorado
Northwest Steelheaders Council of Trout Unltd., Spokane, WA
Oregon Environmental Council, Portland, Oregon
Asotin County Cattlemen's Assoc., Washington
Clearwater Fly Casters, Pullman, Washington
Columbia County Cattlemen's Assoc., Pomeroy, Washington
Columbia County Sportsmen's Assoc., Starbuck, Washington
Columbia River Fishermen's Protective Union, Astoria, Oregon
Cooperative Fishery Unit, Univ., of Idaho, Moscow, Idaho
Garfield County Cattlemen's Assoc., Pomeroy, Washington
Mr. Richard D. Allen, Spokane, Washington
Mr. A. Dale Hutchens, Dayton, Washington
Environmental Policy Center, Washington, D.C.
T & M Contracting, Inc., Winlock, Washington
Mr. Robert McDonald, Pullman, Washington
Trout Unlimited, Woodland, Washington
Pacific Northwest Power Company, Washington, D.C.
Mr. High Smith, Rives-Bonyhaidi-Drummond, Portland, Oregon
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Mr. John Heuley, Jr., Hay, Washington
Pacific Northwest Regional Commission, Vancouver, Washington
Mr. Paul B. Kannowski, Univ. of North Dakota, Grand Forks, ND
Ms. Liz Greenhagen, Raymond, Washington
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Mr. Sol J. Freeman, Richland, Washington
Mr. Bob Phillips, Forest Service, Portland, Oregon

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Whitman County Pomona Conservation Committee, Washington
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Mr. Stephen G. Blankenship, Olympia, Washington
Mr. Ronald E. Bosley, Dayton, Washington
Mr. Lester Boyd, Moscow, Idaho
Mr. J. A. Broughton, Dayton, Washington
Mr. N. Valdez, Moscow, Idaho
Mr. Charles Raines, Bellevue, Washington
Mr. William J. Larson, Clarkston, Washington
Mr. E. C. Yarwood, Spokane, Washington
Mr. George I. Remington, Lewiston, Idaho
Tri-City Herald, Pasco, Washington
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(The) Oregonian, Portland, Oregon
Mr. David H. Chambers, Columbia Basin Bass Club, Washington
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Credit is given to High Country News, 140 North Seventh Street, Lander Wyoming 82520, from which most of the wildlife sketches were taken.

APPENDICES

A. Draft Environmental Statement Coordination Comments and Responses

A'. Revised Draft Environmental Statement Coordination Comments and Responses

B. Vegetation of the Snake River Area

C. Fish of the Snake River Area

D. Amphibians and Reptiles of the Snake River Area

E. Birds of the Snake River Area

F. Mammals of the Snake River Area

G. Potential Development Plan for Project Lands for Wildlife Habitat Improvement

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