UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL MARINE FISHERIES SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

A SPECIAL REPORT
ON THE

LOWER SNAKE RIVER DAMS

ICE HARBOR
LOWER MONUMENTAL
LITTLE GOOSE
LOWER GRANITE

WASHINGTON AND IDAHO

PORTLAND, OREGON
SEPTEMBER 1972

APPENDIX A

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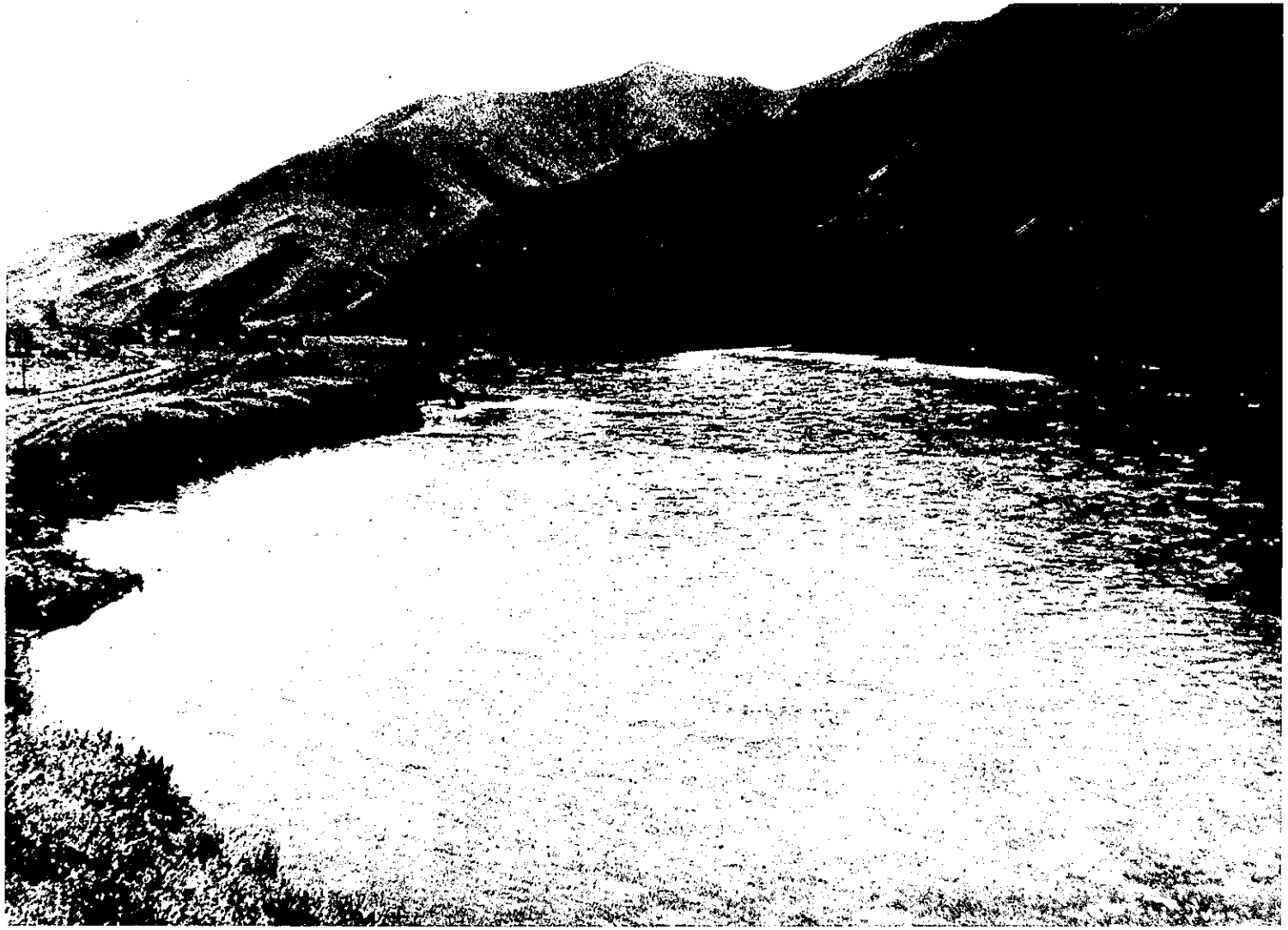
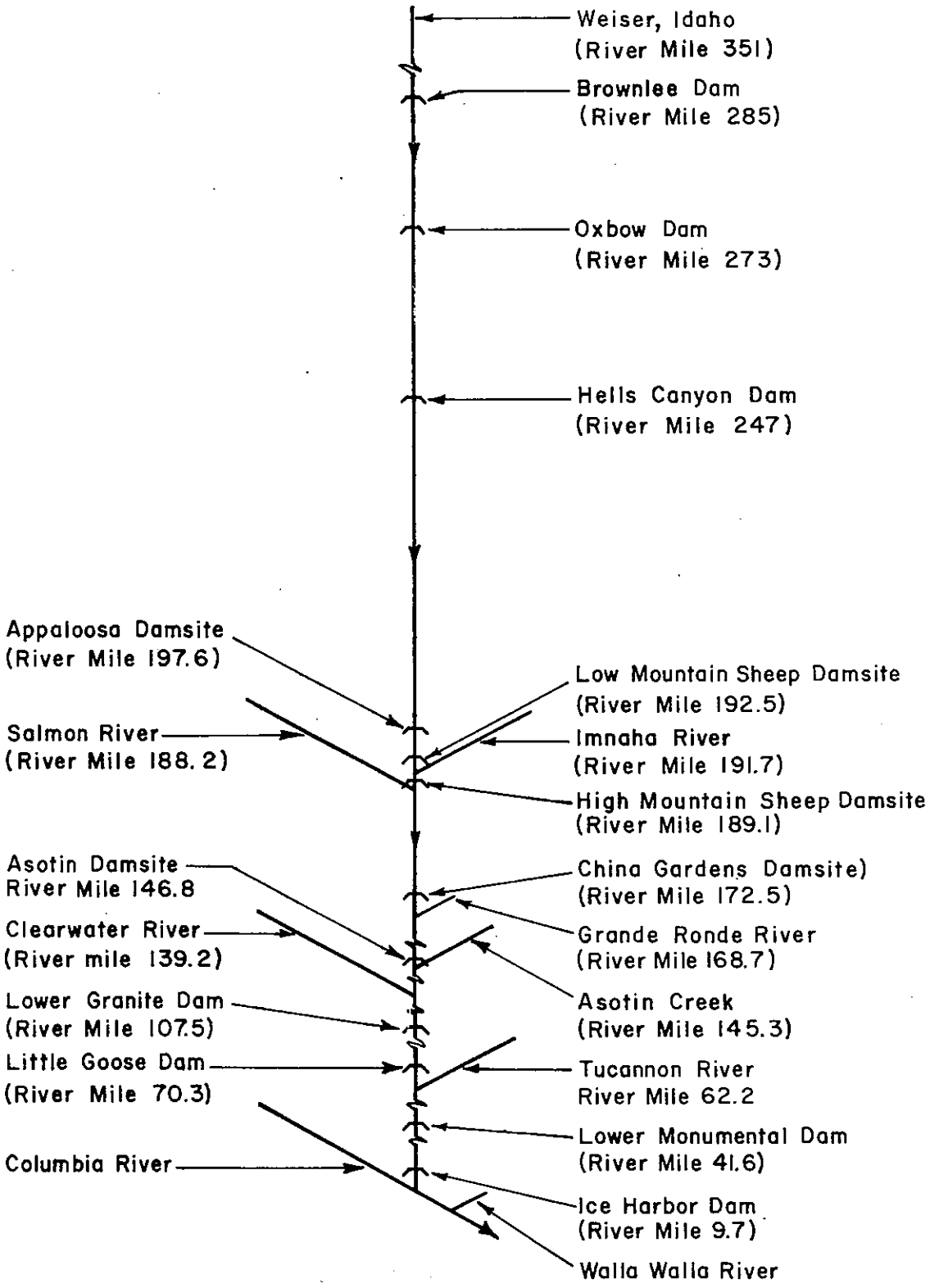


The last remaining freeflowing reach of lower Snake River provides essential fish and wildlife habitat. (Bureau of Sport Fisheries and Wildlife photo)



SNAKE RIVER FROM MOUTH TO WEISER, IDAHO

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

1500 N. E. IRVING STREET
P. O. BOX 3737
PORTLAND, OREGON 97208

September 30, 1972

District Engineer
Walla Walla District, Corps of Engineers
Building 602, City-County Airport
Walla Walla, Washington 99362

Dear Sir:

This is a special report of the Bureau of Sport Fisheries and Wildlife and National Marine Fisheries Service on effects of Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Lock and Dam projects, Snake River, Washington and Idaho, on fish and wildlife and means to reduce project-incurred losses.

This report was prepared in response to Colonel Frank McElwee's April 11, 1966, letter to former Regional Director, Paul T. Quick, Bureau of Sport Fisheries and Wildlife. It augments substantially our previous reports on Ice Harbor, Lower Monumental, and Little Goose projects, and eliminates the need to release a separate Lower Granite project report.

We recognize that your agency continues to disagree with some elements of our fish and wildlife conservation plans as presented in this report. However, these evaluations and recommendations have been generally accepted by concerned conservation agencies as providing the basis for a sound fish and wildlife management plan. Your desire to achieve full compensation for fish and wildlife losses caused by projects under your jurisdiction is commendable. In line with your position, we believe that all reasonable alternatives to our plan should be given full consideration in our joint efforts to obtain adequate compensation for project-incurred fish and wildlife losses.

We would appreciate notification of any material changes in project plans so that if necessary, we may prepare a revised report to provide additional comments.

Please notify us of your proposed actions regarding each recommendation.

Sincerely yours,

JOHN L. FINDLAY
Regional Director
Bureau of Sport Fisheries and Wildlife

Regional Director
National Marine Fisheries Service

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PREFACE

Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Lock and Dam projects, Snake River, Washington and Idaho, were authorized by Public Law 14, 79th Congress, 1st Session, approved March 2, 1945. This report has been prepared under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended, 16 U.S.C. 661 et seq.) and is based upon information and engineering data provided by the Corps of Engineers, Walla Walla District, through March 1972. Washington Department of Fisheries, Washington Department of Game, Idaho Fish and Game Department, Fish Commission of Oregon, and Oregon State Game Commission supplied data useful in the preparation of this report. National Marine Fisheries Service prepared the fishery section. The monetary values assigned to recreational type fish and wildlife benefits are based upon criteria in Supplement No. 1 to Senate Document No. 97.

INTRODUCTION

These four projects are well suited for combined analysis because of their juxtaposition, construction status, and the interrelationship of fish and wildlife resources throughout the lower Snake River system.

Our analysis is based upon a 100-year project life for the years 1962, when the Ice Harbor project was completed, through 2061. Further resource studies, engineering changes, and consideration of presently unknown factors concerning project impact on fish and wildlife resources may require changes in recommended mitigative measures.

This report has been reviewed and concurred in by Idaho Fish and Game Department, Fish Commission of Oregon, Oregon State Game Commission, Washington Department of Fisheries, and Washington Department of Game, as indicated by the appended copies of letters from the respective Directors of these agencies.

Director Crouse of Washington Department of Game indicates concurrence with the report, but provided additional comments on certain elements. We agree that provisions should have been made for more adequate studies of project-affected fish and wildlife resources. However, this report is based on the best information available under imposed manpower and time limitations. The report was revised to reflect as many of Director Crouse's editorial suggestions as possible.

Previous U. S. Fish and Wildlife Service reports on these projects include: (1) A Detailed Report on the Fish and Wildlife Resources, Ice Harbor Lock and Dam Project, Snake River, Washington, May 1, 1959; (2) A Detailed Report on Fish and Wildlife Resources Affected by Lower Monumental Lock and Dam Project, Snake River, Washington, September 1960; and (3) A Detailed Report on Fish and Wildlife Resources Affected by Little Goose Lock and Dam Project, Snake River, Washington, May 7, 1963. This four-project report augments substantially these previous reports and eliminates the need to release a separate Lower Granite project report. In the earlier reports, proposed measures to reduce project-caused fish and wildlife losses were restricted to the immediate project vicinity. Fishery measures recommended included fish passage at each dam and artificial propagation facilities for salmon and steelhead trout. Recommended wildlife measures included management of small land and water areas located along each reservoir. Implementation of recommended fish and wildlife measures was limited to fish passage at the dams.

Initial proposals for offsetting some project-incurred fish and wildlife losses were based on very limited engineering and biological data. Subsequently, more intensive surveys of project-related fish and wildlife revealed much higher losses than originally estimated. Our analysis of more recent biological information derived from limited project studies and other sources necessitates major changes in and additional to various earlier recommendations to significantly offset such losses.

This report emphasizes the importance of offsetting losses of critical fish and wildlife resources and habitat related to the inundated river. The needs of fish and wildlife affected by the four projects have been reconsidered with limited fish and wildlife facilities in place, and additional measures designed to reduce project-related losses have been recommended. Although three of the four lock and dam projects are completed, and early completion of the fourth is anticipated, our analyses of the projects' effects are treated on a "without" and "with" the project basis for ease in evaluation.

DESCRIPTION OF THE AREA

Physical Features

Snake River drains an area of 109,000 square miles, including portions of Idaho, northwestern Wyoming, northern Utah and Nevada, southeastern Washington, and eastern Oregon.

Snake River flows through a canyon that varies in depth from about 5,500 feet in upstream Hells Canyon (and in the projects' area, from 2,000 feet near Lewiston, Idaho), to about 100 feet near its confluence with the Columbia River. There are many islands and gravel bars within the river channel. The canyon is bounded by terraced bluffs throughout the projects' area. Upland soils are of loessal origin. Alluvial bottomland soils in this area vary from sandy to silty loams which are frequently interspersed with basalt rock outcroppings. These soils support productive riparian vegetation. Winters are moderately cold with much milder conditions along the river than on adjoining Palouse uplands. Summers are hot and dry. The mean annual precipitation varies from 10 to 15 inches, mostly occurring during winter and spring. Snake River runoff is characterized by low flows from August through February and high flows from March through July.

Commercial Features

The four projects are located within a sparsely populated area. Water is pumped from the river to irrigate some fertile bottomlands. Cattle and sheep graze most of the adjoining slopes. The region's economy is largely dependent on dryland grain farming and livestock production.

Union Pacific, Burlington Northern, and Camas Prairie railroad lines extend along much of the projects' affected reaches. Access to the lower Snake River canyon is mostly by county and private roads extending along most reaches of the river. Major highway crossings occur at several points. Limited barge navigation presently occurs on Ice Harbor, Lower Monumental, and Little Goose Reservoirs. When Lower Granite Reservoir is impounded, however, barge traffic to the Lewiston-Clarkston area is expected to be substantial. Washington Water Power Company operates Lewiston Dam on the Clearwater River near its Snake River confluence. A series of Federal and privately owned dam, located mostly on Snake River upstream from Hells Canyon, are operated primarily for irrigation and power production.

Major sources of water pollution affecting the lower Snake River are upstream logging, livestock feedlots, agricultural crops, industrial and domestic sewage, and nitrogen supersaturation. A pulp mill at Lewiston, Idaho, is also a source of heavy air and water pollution.

The major fish and wildlife developments in the vicinity of lower Snake River are the McNary Wildlife Recreation Area operated by Washington Department of Game and the adjoining McNary National Wildlife Refuge administered by Bureau of Sport Fisheries and Wildlife. Both of these wildlife management areas are located adjacent to McNary Reservoir on Columbia River near its Snake River confluence. Other nearby wildlife management areas operated by Washington Department of Game include Asotin Wildlife Recreation Area near Clarkston, and William T. Wooten Wildlife Recreation Area on upper Tucannon River. The latter includes Tucannon Trout Hatchery and rearing and fishing ponds.

DESCRIPTION OF THE PROJECTS

Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Lock and Dam projects were authorized to provide slackwater navigation, irrigation, and hydroelectric power generation. Lower Granite project is also expected to provide flood protection for the Lewiston-Clarkston area. Ice Harbor, Lower Monumental, and Little Goose Lock and Dam projects were basically completed in 1962, 1969, and 1970, respectively. The upstream Lower Granite project is scheduled for completion in 1975.

The completed projects are similar in design and operation. Developments include concrete dams with powerplants, navigation locks, recreation areas, and fish passage facilities. They involve railroad relocation or reconstruction and bridge modification. Levees with pumping plants will be constructed in the Lewiston-Clarkston area.

Pool elevations of the projects will vary according to seasonal runoff, power operations, and navigational requirements. Pool levels will fluctuate up to several feet daily for power peaking purposes. Tailwater fluctuations for power peaking operations may range up to five feet in the case of the Ice Harbor project (table 1), but may range up to 35 feet under flood flows depending on timing and volume of reservoir releases.

Table 1. Pertinent Engineering and Operation Data, Lower Snake River Projects

Project	Elevation (feet) m.s.l.	Capacity (acre-feet)	Surface Area (acres)	Stream Inundated (river miles)
Ice Harbor				
Normal pool	440	417,000	9,200	35.0
Tailwater	337 - 342*			
Lower Monumental				
Normal pool	540	377,000	6,590	29.0
Tailwater	437 - 441*			
Little Goose				
Normal pool	638	565,000	10,025	37.2
Tailwater	537 - 541*			
Lower Granite				
Normal pool	738	485,000	8,900	39.0
Tailwater	633 - 639*			
Totals		1,844,000	34,715	140.2

* Tailwater range for nonflood period.

FISH RESOURCES

General

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.

Water development projects throughout the Snake River system have greatly reduced anadromous fish numbers. A portion of the runs of spring chinook and steelhead reaching Hells Canyon Dam on the Snake has been relocated to the Salmon River system. Vast areas of once important spawning and rearing habitat for anadromous fish have been inundated by large reservoirs, or made inaccessible by dams and, therefore, are unavailable for production.

Prior U. S. Fish and Wildlife Service reports on Ice Harbor, Lower Monumental, and Little Goose projects recommended measures to minimize fishery losses on an individual project basis; such measures were largely limited to upstream fish passage facilities at the dams, spawning channel development, and artificial propagation of anadromous species. Fish passage facilities have been the only features provided. According to the Corps of Engineers, these facilities were constructed at a cost of $38,844,000. Research is being conducted to develop measures to provide improved conditions for juvenile fish migration at the four lower Snake River dams. The initial measures for minimizing losses to anadromous and resident fisheries were based on insufficient information and were not adequate to maintain these fisheries. Therefore, to maintain the runs of anadromous fish in the Snake River system and to offset losses to the sport fishery for anadromous and resident species, measures recommended in the earlier reports must be augmented and accomplished.

This proposed plan for offsetting anadromous fish losses is based on salmon and steelhead trout counts at Ice Harbor and McNary Dams. It does not include compensation for losses due to nitrogen supersaturation, but assumes that every possible means to promptly eliminate this problem is being explored. Additionally, the plan does not consider mitigation for losses of sockeye and coho salmon which occur in lesser numbers in the Snake River system.

Figure 1. An excellent catch of Snake River run steelhead trout. (Idaho Fish & Game Dept. photo)

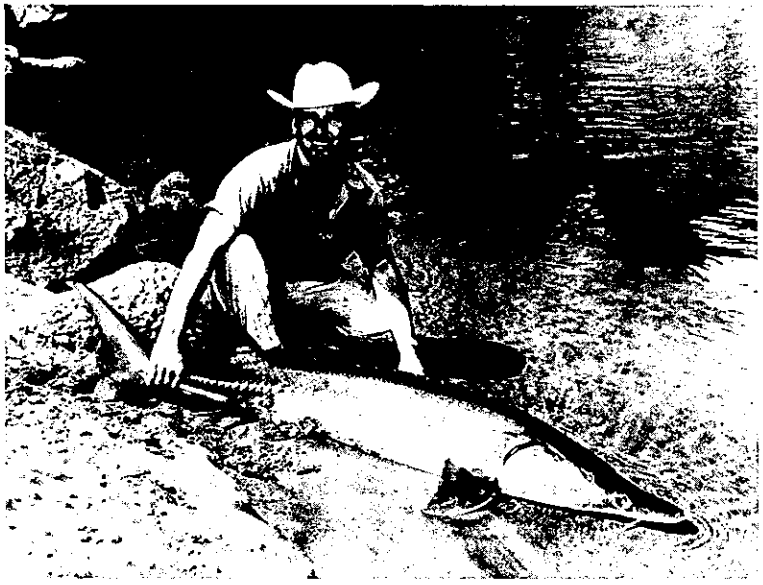

Figure 2. Diminishing white sturgeon population in Snake River is confined to the few freeflowing reaches. (Idaho Fish & Game Dept. photo)

Without the Projects

Anadromous Fish

Prior to construction of Ice Harbor Dam, there was no record of the actual number of anadromous fish utilizing the Snake River system. Determination of the representative numbers in this system of each species is based on the maximum count at McNary Dam from 1954 to 1967 and the maximum percentage of McNary count passing over Ice Harbor Dam from 1962 to 1967 (table 2 and schematic diagram). At both dams, unknown numbers of steelhead trout migrated upriver during noncounting periods in most years, and larger runs occurred at McNary Dam prior to the years of counting at Ice Harbor Dam.

The following method is intended to determine a reasonable estimate of average annual Snake River escapements before major dam construction started in the early 1950's. However, in this report compensation is not being recommended for losses caused by other than lower Snake River dams.

Production rates (i.e., return per spawner) since the mid-1950's (the period of record at McNary Dam) for spring chinook, summer chinook, summer steelhead, and sockeye are only about half that of earlier years. Also, the percentage Ice Harbor of McNary counts of spring and summer chinook in 1969 and 1970 exceeded 60 percent whereas 55 percent is used as the "maximum" value in table 2. (Actually, percentage Ice Harbor of Ice Harbor plus Priest Rapids counts for those years exceeded 70 percent in 1969 and 1970.) Consequently, maximum values at McNary for the years 1954-67 and at Ice Harbor for the years 1962-67 are probably conservative estimates of average annual runs in earlier years.

Having calculated representative numbers for each of the species utilizing the Snake River (table 2), estimated percentage losses attributed to passage at the four dams were applied to these to determine the estimated numbers of fish that must be produced by hatcheries to offset the losses.

An important sport fishery for steelhead trout in the project area amounting to about 130,000 angler-days annually during project life, would have been maintained without the projects.

Resident Fish

Principal resident game fish in the lower Snake River project area are smallmouth and largemouth bass, white sturgeon, and channel catfish. Less important species are rainbow and brown trout, Dolly

Table 2. Estimated Distribution of Salmon and Steelhead Trout Runs to Snake River System in Percent and Number*

River Segment	Fall Chinook Maximum Count McNary Dam 97,500 (1958) Distribution Percent	 No. Fish	Spring-Summer Chinook Maximum Count McNary Dam 222,100 (1957) Distribution Percent	 No. fish	Steelhead Maximum Count McNary Dam 172,600 (1962-63) Distribution Percent	 No. Fish
Snake River						
Lwr. Monumental-China Gardens (main stem spawning)	26.5	17,600			4.0	4,600
Tucannon River			2.0	2,400	3.0	3,400
Clearwater River	0.5	300	0.5	600	37.5	43,200
Asotin Creek					1.5	1,700
Grande Ronde River			10.0	12,200	14.0	15,900
Snake River:						
China Gardens-High Mtn. Sheep	5.5	3,600				
Salmon River			79.5	97,200	30.5	35,200
Imnaha River	0.5	300	5.5	6,700	3.5	4,000
Snake River:						
High Mtn. Sheep-Appaloosa	1.5	1,100				
Appaloosa-Pleasant Valley	5.5	3,600				
Pleasant Valley-Hells Canyon	33.0	22,000				
Hells Canyon Dam Fish Facilities	27.0	17,800 4/	2.0	2,500	5.0	5,700
Small Tributaries:						
Imnaha River-Hells Canyon Dam			0.5	600	1.0	1,100
	100.0	66,300 1/	100.0	122,200 2/	100.0	114,800 3/

1/ McNary Dam maximum count 97,500 x 68% = 66,300 (rounded to nearest 100) (68% is the highest percent of McNary counts over Ice Harbor 1962-67.)

2/ McNary Dam maximum count 222,100 x 55% = 122,200 (rounded to nearest 100) (55% is the highest percent of McNary counts over Ice Harbor 1962-67.)

3/ McNary Dam maximum count 172,600 x 66.5% = 114,800 (rounded to nearest 100) (66.5% is the highest percent of McNary counts over Ice Harbor per fish year 1962-67 adjusted to include estimates of fish migrations during months when no counts were made.)

4/ The highest count at Oxbow Dam (1958) prior to construction of Hells Canyon Dam. This includes 3,497 known mortality downstream from the dam in October.

Note: Counting period breakdown: Fall chinook..... August 9 to October 31
Spring-summer chinook... April 1 to August 8
Steelhead..... July 1 to June 30

*Table based on data available through 1967 and does not reflect distribution that could occur within any section or tributary in any given year.

Varden, brown bullhead, mountain whitefish, white crappie, and bluegill. Nongame fish include carp, squawfish, suckers, chiselmouth, and shiners. Since 1964, Washington Department of Game has conducted evaluation studies on the lower Snake River sport fishery. Based on these studies, estimated average annual man-days use during project life would have been 250,000 angler-days without the projects.

With the Projects

Anadromous Fish

Large numbers of upstream migrating fish are killed each year as a result of fish passage and nitrogen supersaturation problems at Columbia River and Snake River dams. Very large numbers of smolts are killed as they migrate downstream through the reservoirs and dams. Spawning and rearing areas for anadromous fish are being lost because of dam construction on lower Snake River. As a result of these developments anadromous fish runs in Snake River are expected to continue to decline. Because of current efforts to alleviate the nitrogen supersaturation problem, this report does not include compensation plans for nitrogen related mortality.

Studies at Ice Harbor Dam indicate a 30-percent mortality to salmonid smolts passing through the turbines. This includes mortalities due to predation on stunned fish. Many studies have verified a direct mortality without predation of 11 percent for turbines of the type used at the lower Snake projects. Considering the fact that in the future most of the water will pass through the turbines, an estimated total mortality of 15 percent per dam may be conservative. In passing the four-dam complex, this would result in a cumulative 48-percent loss of salmon smolts. Since ocean mortalities on salmonids spending a year or more in salt water are not likely to be density dependent, a 48-percent smolt kill can be translated to a 48-percent reduction in returning adults.

There are other project-related factors influencing fish survival. Adult migrant mortalities have not been considered, although losses in lower Columbia River between 1962 and 1967 indicate an average mortality of 16 percent per dam. Counts at Lower Monumental and Little Goose Dams in 1970 did not indicate such a direct loss of adults, but after completion of Lower Monumental Dam an all time high count at Ice Harbor Dam in 1969 produced an all time low spawning ground count in Idaho streams. This indicates that delayed mortalities upstream from Lower Monumental Dam were very great. Although no percentage can be calculated, much of this loss may have been due to nitrogen supersaturation. In any case, the proposed plan does not consider mortalities due to nitrogen on either adult or juvenile migrants. Also, probable effects due to delay of juvenile migrants

are not considered. On the other hand, if current efforts to transport or bypass downstream migrants are successful they may counter some of the losses. In this event appropriate adjustments can be made in the program after all favorable and unfavorable factors have been evaluated. The urgency of initiating this program without awaiting such evaluation cannot be overstressed if important runs are to be maintained at a viable level.

Traveling fish screens have been installed on an experimental basis in the intakes to one of the turbines at Little Goose Dam and are scheduled to be installed in all of the turbine intakes at this dam prior to the downstream migration period in the spring of 1973. The fishery agencies have recommended that these be evaluated from a mechanical and biological standpoint before proceeding with similar installations at the other projects. The Corps of Engineers has scheduled design and construction of traveling screens at all of its Snake and middle Columbia River projects. Studies to date indicate that up to 80 percent of the downstream migrants may be diverted by such screens making them available for bypass around individual dams or a series of dams by means of truck transport. To the extent that the screens reduce the fingerling mortality, the requirements for artificial propagation will be reduced. In any event, it is anticipated that substantial hatchery programs will still be required to compensate for losses occurring to upstream migrants as a result of delay and mechanical injury, losses of fingerling through the turbines and in connection with screening and bypass and/or transportation facilities, losses resulting from delay or downstream migrant passage through the reservoirs, and losses resulting from inundation of spawning grounds. Construction and operation of such hatchery facilities should be initiated as quickly as possible to offset these losses. In view of the time element involved in initiating hatchery construction, we foresee no possibility of overcompensating for these losses.

Resident Fish

Since Ice Harbor Dam was completed, studies show a much higher fishery loss than originally anticipated.

The high quality stream fisheries for smallmouth bass, white sturgeon, and channel catfish within Ice Harbor, Lower Monumental, and Little Goose Reservoir areas have been converted to a low quality reservoir-type fishery with abundant populations of undesirable fish. However, fisherman use for resident game fish species within the remaining freeflowing river portion of the project area has increased many times since initiation of Ice Harbor Dam construction in 1960.

Figure 3. The 25-pound flathead catfish (1970 Idaho record) and channel catfish were caught in Snake River near Lewiston. (Idaho Fish & Game Dept. photo)

Figure 4. Project development has adversely affected the excellent smallmouth bass sport fishery on lower Snake River. (Washington Dept. of Game photo)

A fishery for warmwater species will develop in the impoundments with average annual use during the project life estimated at 205,000 angler-days. Such a fishery would not compensate for the 250,000 stream angler-days lost in the reservoir areas. The loss is actually greater than the 45,000 difference, because two stream angler-days are equivalent to three reservoir angler-days in value. Loss of the white sturgeon fishery in Snake River within the project area cannot be offset.

Plan of Development

Anadromous Fish

Runs of spring and summer chinook salmon and steelhead trout comparable to the preproject runs can be maintained in the Snake River system through appropriate fishery programs, including improved fish passage, both upstream and downstream at dams on Columbia, Snake, and Clearwater Rivers; artificial propagation; habitat improvement; control of nitrogen supersaturated water in Snake River; and implementation of any additional measures necessary to prevent further losses resulting from project development at the four lower Snake River dams.

The plan presented in this report provides partial compensation for fishery losses incurred as a result of the four-dam complex and features artificial propagation. Plan adoption would provide the number of salmon and steelhead trout needed in the Snake River system to help maintain commercial and sport fisheries for anadromous species on a sustaining basis in the Columbia River system and Pacific Ocean.

Fall Chinook Salmon. The representative run of fall chinook salmon in the Snake River is 66,300 (table 2). Spawning habitat for approximately 5,000 adults will be lost by inundation within the project area. The downstream migrant progeny of the remaining 61,300 will undergo an estimated 48-percent mortality. This will reduce the run by an additional 29,400 so that compensation for a total of 34,400 adults will be required (table 3). State and Federal fishery agencies have determined that fall chinook salmon contribute little to the sport fish resources in the Snake River drainage and that the entire run could conceivably be relocated to lower Columbia River downstream from McNary Dam. A hatchery capable of handling 8,800 adult chinook would be required to produce the 34,400 adults (table 4).

Table 3. 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				
	Escapement	Pounds	Value	Escapement	Pounds	Value	Escapement	Pounds	Value	W/Comp. Ang.days	WO/Comp. Ang.days	Diff. Ang.days
Columbia R. System, Ocean												
Fall chinook [2/]	66,300	3,381,000	$1,893,000	31,900	1,627,000	$911,000	34,400	1,754,000	$982,000	332,000	160,000	172,000
Spring and summer chinook [2/]	122,200	6,232,000	3,490,000	63,500	3,238,000	1,813,000	58,700	2,994,000	1,677,000	611,000	318,000	293,000
Steelhead [3/]	114,800	692,000	208,000	59,700	360,000	108,000	55,100	332,000	100,000	763,000	397,000	366,000
Totals	303,300	10,305,000	$5,591,000	155,100	5,225,000	$2,832,000	148,200	5,080,000	$2,759,000	1,706,000	875,000	831,000
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 $0.56 per pound.

[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 $0.30 per pound.

[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 $6.00).
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.

Table 4. Estimated Losses, and Artificial Propagation Costs Associated With Anadromous and Resident Fish Maintenance, Following Lower Snake River Project Construction 5/

Species	Maximum Run	Loss (Adults)	Hatchery			Collecting, Eyeing, Holding, & Transportation	
			Number (Adults)	Capital Costs	Annual OM&R Costs	Capital Costs	Annual OM&R Costs
Fall chinook	66,300	34,400 1/	8,800	$ 4,360,000	$ 244,000	$ 935,000	$ 50,000
Spring & summer chinook	122,200	58,700 2/	3,800	8,960,000	502,000	432,000	50,000
Steelhead trout	114,800	55,100 2/	7,200	18,140,000	834,000	819,000	95,000
Rainbow trout			(85,000) 3/	1,275,000 4/	96,000 4/		
Total Costs				$32,735,000	$1,676,000	$2,186,000	$195,000

1/ Based on total replacement for 5,000 adults in inundated spawning area, plus cumulative smolt loss of 48% at four dams.

2/ Based on 15% smolt loss for each of the four dams or cumulative loss of 48%.

3/ Number of pounds needed for liberation at three to the pound.

4/ Costs include collecting, eyeing, holding, and transportation as well as hatchery requirements.

5/ Total capital costs of $39,121,000, are obtained by adding land acquisition and development costs for fishing access of $4,200,000, to the total capital costs given above. Similarly, total OM&R costs are $1,901,000. These costs were developed in 1968; consequently, substantial increases can be anticipated at the time of construction.

Spring and Summer Chinook Salmon. The representative number of adult spring and summer chinook salmon in the Snake River system is 122,200 (table 2). Downstream smolt losses through the project area are estimated at 48 percent. To offset this loss, hatchery facilities would be required capable of producing 58,700 adults to the Snake River upstream from Lower Granite Dam (table 3). Hatchery facilities would have to be provided to produce to smolt size the offspring from 3,800 adult salmon (table 4).

Steelhead Trout. The representative run of adult steelhead trout to be maintained in the Snake River system after completion of the four dams on lower Snake River is 114,800 fish (table 2). Estimated total loss of downstream migrants at the four dams is 48 percent. To offset this loss, artificial propagation facilities capable of producing 55,100 adult steelhead trout to the escapement upstream from the project area would be necessary (table 3). To provide these fish, hatchery facilities capable of rearing progeny from 7,200 adults will be required in the Snake River system upstream from the project area (table 4). The sport fishery for steelhead trout in this area will be virtually destroyed by inundation of 140 miles of freeflowing stream. Preproject annual steelhead fishing use in the area was estimated at 52,000 angler-days. This would project to 130,000 angler-days annually during the 100-year project life. There is no known way to mitigate this loss other than by providing permanent public fishing areas along streams of known high use, such as Grande Ronde River in Washington and Oregon, Salmon and Clearwater River in Idaho, and Tucannon River in Washington.

Hatchery Requirements. Location and size of the hatchery sites and rearing facilities and the operating entities would be determined at a later date by the interested State and Federal fishery agencies. Capital, operation, maintenance, and replacement costs for all mitigation measures should be project funded.

Estimated annual value of the anadromous fish resources affected by the four-dam complex is approximately $5,591,000 to the commercial fisheries with compensation and $2,832,000 without compensation measures, a difference of $2,759,000 (table 3). Angler-day use of the sport fishery for anadromous fish resources affected by the projects would be 1,706,000 with compensation and 875,000 without compensation measures, a difference of 831,000 angler-days (table 3). Offsetting project-incurred losses to anadromous fish by construction of hatcheries would require a total capital investment of $33,646,000, and $1,775,000 annually for their operation and maintenance (table 4).

Resident Fish

The plan also provides for establishment of a high quality sport fishery for resident species in streams tributary to the project area to offset, in part, losses of the excellent smallmouth bass, channel catfish, and white sturgeon fisheries in lower Snake River.

Loss of 45,000 angler-days of the stream fishery for resident species in the project area (table 3), could be offset by supplemental stocking of catchable size rainbow trout in southeastern Washington streams tributary to Snake River such as Asotin Creek, and Touchet, Walla Walla, and Tucannon Rivers. Compensation would require artificial propagation facilities capable of producing 85,000 pounds of catchable size rainbow trout, three to the pound (table 4). Estimated capital cost is $1,275,000. Annual operation, maintenance, and replacement costs would be approximately $96,000 (table 4).

WILDLIFE RESOURCES

Without the Projects

Habitat

The rich alluvial soils along Snake River within the area of influence of Ice Harbor, Lower Monumental, Little Goose, and Lower Granite projects supported many kinds of trees, shrubs, grasses, forbs, and cultivated crops which provided essential food and cover for wildlife. Willows, alders, hackberries, and an understory of teasel, poison oak, sumac, wild rose, cocklebur, cheatgrass, and wild rye, comprised natural streambank cover. Dryer areas supported sagebrush and rabbitbrush, interspersed with grasses. Other plants included Russian thistle, lupine, Jim Hill mustard, downy chess, and sanddock. Crops on agricultural land consisted primarily of grain, forage, and orchards.

Big Game

Resident mule and white-tailed deer herds inhabited the bottomlands and adjoining slopes in moderate numbers. Significant numbers of migrant deer from bordering uplands utilized the river valley during fall and severe winters. Bottomland habitat within the project area helped support many deer that contributed substantially to the harvest on surrounding areas. The highest deer populations occurred in Little Goose and Lower Granite project areas of influence. The average annual hunter use expended over the project life for deer that were dependent upon habitat within the four reservoir sites and adjacent project-affected lands is estimated at 12,600 hunter-days without the projects. Estimated annual harvest is 400 deer.

Figure 5. Before inundation by reservoir waters, streamside vegetation provides vital food and cover for wildlife. (Bureau of Sport Fisheries and Wildlife photo)

Figure 6. Following inundation, the banks are bare and eroding, and little habitat remains to sustain wildlife. (Bureau of Sport Fisheries and Wildlife photo)

Upland Game

A variety of upland game inhabited the flood plain and contiguous lands. The most abundant species were California quail, ring-necked pheasant, chukar, gray partridge, and mourning dove. They were common in the projects' area and all were highly dependent upon habitat along the river.

Shrubs and trees interspersed with agricultural lands on the flood plain provided excellent living conditions for pheasant, quail, and cottontail populations. The abundant chukars and other arid land wildlife occurring in numerous canyons and on slopes adjacent to the project-affected river reaches were seasonally dependent upon stream-side habitat. The four-dam areas of influence supported high quality hunting, diverse species, and good public access along many river reaches. These factors attracted hunters from considerable distances. The average annual hunter use for upland game dependent on project-affected lands was about 43,900 man-days without the project with about 27,400 small game animals harvested.

Fur Animals

Fur animals living along the lower river were beavers, muskrats, minks, raccoons, skunks, weasels, bobcats, river otters, badgers, and coyotes. Beaver, muskrat, and mink were the species of principal economic importance. Fur harvest fluctuates markedly according to market demands. Low demand for most furs resulted in a pelt harvest several times lower than fur animal populations could support. The average annual harvest from the reservoir sites was 4,200 pelts without the projects.

Waterfowl

Lower Snake River provided important waterfowl habitat. Islands and shorelands along the river provided resting and feeding areas used annually by observed peak winter populations of 140,000 ducks and 35,000 geese. An estimated 600 goslings were reared to flight stage annually by 400 resident Canada geese along the lower Snake. A few ducks nested in the project area. Waterfowl hunting in adjoining counties was largely dependent on duck and goose populations that wintered on the lower river and flew out to feed on nearby croplands. Waterfowl hunting restrictions along most reaches of the river served to hold wintering waterfowl that supported local field hunting. The average annual hunter use of waterfowl based upon goose production on project-affected areas was 1,100 hunter-days without the projects.

Figure 7. Islands in lower Snake River provide important resting and breeding habitat for numerous waterfowl. (Bureau of Sport Fisheries and Wildlife photo)

Figure 8. Project reservoirs have inundated numerous islands formerly utilized by resident geese as production areas. (Washington Dept. of Game photo)

Figure 9. Chukars and other upland game sought by hunters depend upon habitat being lost to lower Snake River reservoirs. (Washington Dept. of Game photo)

Figure 10. Wildlife observation is a significant recreational activity in riverine habitat. (Bureau of Sport Fisheries and Wildlife photo)

Nongame Wildlife

Relatively mild temperatures and excellent vegetative cover along the river promoted heavy year-round use of the project area by migratory and resident nongame wildlife species. Numerous migratory perching birds including sparrows, warblers, vireos, flycatchers, kingbirds, tanagers, orioles, robins, and woodpeckers, depend upon streamside habitat destroyed by the projects. Other species affected by the project include hawks, owls, kingfishers, and shorebirds. Less conspicuous wildlife destroyed include several species of snakes, lizards, amphibians, and small mammals including the uncommon Merriam's shrew. Growing numbers of nature enthusiasts and students enjoyed the variety of birds and other nongame wildlife found here.

With the Projects

Habitat

Project reservoirs and related construction have or will have destroyed most of the natural environment that provided essential food and cover for wildlife living along the lower 140 miles of Snake River. Terrestrial habitat loss from inundation, railroad relocation, and other project effects was or will be about 3,600 acres at Ice Harbor, 3,900 acres at Lower Monumental, 5,300 acres at Little Goose, and 3,600 acres at Lower Granite project. We estimate that for most wildlife the projects either directly or indirectly affect adversely over 100,000 acres of habitat in a mile-wide band extending along lower Snake River canyon. Big game range influenced is considered to cover roughly a ten-mile-wide band along the canyon. The original land-water relationship was adversely changed with virtually a complete loss of interspersed brushy shoreline, agricultural land, and river island habitat. Wildlife populations and wildlife-oriented recreation dependent on the habitat were drastically reduced.

Big Game

Project reservoirs have destroyed habitat areas along Snake River that contributed substantially to deer production. These habitat losses are reflected in reduced deer populations and hunting success. Additionally, loss of public access has further reduced deer harvest along the river canyon. With the projects the average annual man-days use for big game will be 2,700 hunter-days.

Upland Game

California quail, ring-necked pheasant, chukar, gray partridge, mourning dove, and cottontail populations have been greatly reduced because of the loss of native streamside vegetation which provided essential habitat. Other game species have been less severely affected. Loss of public access from road inundation has resulted in additional losses of upland game hunting opportunities. Destruction of habitat and road access along the river is reflected in reduced game harvest in the bordering counties extending from the Idaho-Washington line to the Snake River mouth. There will be an anticipated overall average annual use of 15,400 man-days of upland game hunting with the projects.

Fur Animals

Project reservoirs have destroyed considerable fur animal habitat. Beaver numbers have been drastically reduced with lesser losses sustained by other species. The average annual fur animal harvest is estimated at 2,100 pelts with the projects.

Waterfowl

Waterfowl have been adversely affected by the combined effects of the four projects. There has been a serious loss of goose-nesting sites and a decrease in overall goose and duck use of the area caused by loss of islands, flats, and gravel bars. Project reservoirs have or will inundate an estimated 40 islands comprising 550 acres. Several islands formed by the reservoirs will reduce overall losses to about 490 acres. The local waterfowl harvest has been reduced. Although a large island will be formed in Lower Granite Reservoir in the vicinity of Silcott, and several lesser islands have been formed elsewhere, most of the goose-nesting habitat has been destroyed. Additionally, streamside pastures needed for goose grazing and production have been inundated. There will be an average annual use of 100 man-days of waterfowl hunting based on goose production with the projects.

Nongame Wildlife

Severe losses of resident and migratory nongame wildlife have resulted from project effects. These losses are directly related to destruction of the rich alluvial lands that support vegetation providing wildlife cover and food. Over 3,100 acres of critical nongame wildlife habitat was destroyed by inundation, railroad relocation, and other project activities. Environmental quality has declined over a wide area because esthetic and natural pest control values provided by seed-eating and insectivorous birds have been lost. A comparison of non-game wildlife "before" and "after" inundation of riparian woody vegetation shows that numerous valuable birds such as yellow warblers, song sparrows, western tanagers, house wrens, black-headed grosbeaks,

red-shafted flickers, lazuli bunting, flycatchers (sp), robins, yellow breasted chats, sparrow hawks, and vireos (sp) are replaced predominantly by a few blackbirds and meadowlarks, species that do not require extensive stands of shrubs and trees required by the previously mentioned varieties. Other less conspicuous nongame wildlife destroyed by the projects include several species of reptiles, amphibians, and small mammals including the uncommon Merriam's shrew. The extent of such losses cannot be readily measured in terms of human use because of their largely intangible nature. However, increasingly heavier use by birdwatchers, photographers, and other nature enthusiasts of State and Federal wildlife recreation and refuge areas indicates importance of nongame wildlife. These people are part of a group engaged in the fastest growing form of outdoor recreation in this region.

Wildlife values in the project areas are summarized in table 5.

Table 5. Average Annual Wildlife Values in User-Days, Lower Snake River Projects

Group	Without Projects (Hunter-Days)	With Projects (Hunter-Days)	Difference (Hunter-Days)
Big game	12,600	2,700	- 9,900
Upland game	43,900	15,400	-28,500
Waterfowl 1/	1,100	100	- 1,000
Nongame 2/	3,100 (acres)	0	- 3,100 (acres)
Fur animals 3/	4,200 (pelts)	2,100 (pelts)	- 2,100 (pelts)

1/ Based on project-related goose production only.
2/ Evaluated in terms of critical habitat rather than hunter-days.
3/ Evaluated in terms of pelts harvested rather than trapper-days.

DISCUSSION

Fish

Anadromous Fish

The Snake River drainage is the most important production area for anadromous fish in the Columbia River system. Most of the spring and summer chinook salmon and steelhead trout migrating upstream in the Columbia past McNary Dam are destined for the Snake River system (table 2). Anadromous fish reared in this area contribute substantially to both the sport and commercial fisheries in Oregon, Washington, Idaho, California, and Alaska and Pacific Ocean. With artificial propagation, continuation of fishery management programs and measures to reduce nitrogen supersaturation of water, large numbers of salmonids of inestimable value can be maintained in the Columbia and Snake River systems.

Studies conducted by National Marine Fisheries Service demonstrate that losses of juvenile anadromous fish migrating through lower Snake River have been as high as 70 percent, primarily as a result of nitrogen supersaturation (up to 146 percent). Losses of a similar magnitude have been demonstrated during high spill periods between Ice Harbor and Bonneville Dams and between Bonneville Dam and Rainier, Oregon. In the past few years, serious additional mortality has occurred to adult salmonid migrants as a result of this critical problem.

With planned construction and operation of Lower Granite Dam, the cumulative effect of nitrogen supersaturation in Snake River could possibly eliminate anadromous fish from this drainage. This definitely represents a crisis situation which must be resolved immediately.

The cycle of nitrogen supersaturation in Snake River water occurs annually. Such waters do not equilibrate rapidly in slackwater of Columbia and Snake River impoundments. The dissolved nitrogen concentration tends to be cumulative from one impoundment to the next. Lack of circulation tends to slow the equilibration rate and this combined with increases in surface water temperature increases the fish mortality.

Subsurface impoundment water drafted through turbine intakes does not increase dissolved nitrogen concentrations in tailrace water. With development of the power potential at the four dams on lower Snake River, spillway flows could be substantially reduced during the critical period of both upstream and downstream anadromous fish migrations, provided that electrical energy loads were adjusted within the power system to permit full loading of generator units at these projects, thus reducing nitrogen concentration and fish mortality rates from that source.

Hatchery facilities are proposed to offset losses, other than those due to nitrogen, that have occurred and will continue to occur to anadromous

fish as a result of the projects. Such facilities would be based on water reuse and recirculating systems, and their size would be dependent upon the number of adults needed for artificial production.

Spawning area for approximately 5,000 fall chinook salmon will have been inundated by the impoundments. Approximately 61,000 adult fall chinook have utilized Snake River upstream from the projects and would be adversely affected by these dams. Full compensation for fall chinook losses could be provided by development of artificial propagation facilities on Columbia River downstream from Ice Harbor Dam to produce 34,400 adults. This would also require construction of a collection and holding facility at one of the lower Snake River dams and a hauling facility to the hatchery.

Estimated capital cost for the hatchery and rearing facility in Columbia Basin downstream from the projects' area, to rear the progeny from 8,800 adult chinook salmon, is $4,360,000. Annual operation, maintenance, and replacement costs are estimated at $244,000.

Estimated capital cost for the collection, holding, and transportation facility for 8,800 adult fall chinook salmon is $935,000. Annual operation, maintenance, and replacement costs are estimated at $50,000.

To offset losses caused by the four dams and to maintain the representative run of 122,200 spring and summer chinook salmon in the Snake River system, artificial propagation facilities capable of producing 58,700 adults to the spawning escapement upstream from the projects' area will be required. Collection, holding, and eyeing facilities will be required in upper Grande Ronde River, Oregon, and Salmon River. Hatchery facilities sized to rear the progeny from 3,800 adult spring and summer chinook, located in the upper Snake River drainage, at the best natural water supply, would be necessary. Transportation facilities to haul smolts from the hatchery to the rearing streams would also be required.

Estimated capital cost for hatchery rearing, and hauling facilities on upper Snake River to rear the progeny from 3,800 adult, spring, and summer chinook to smolt size and transport them to their parent streams is $8,960,000. Annual operation, maintenance, and replacement costs are estimated at $502,000. The technique for estimating hatchery requirements is presented in the appendix.

Estimated capital cost for collection, holding, eyeing, and transportation facilities on Grande Ronde and Salmon Rivers is $432,000. Annual operation, maintenance, and replacement costs are estimated at $50,000.

An important sport fishery for steelhead trout in Snake River averaging about 130,000 angler-days annually during project life, will be lost because of the impoundments. There are no known means in the project

area to offset the loss of a stream sport fishery for steelhead trout that has been displaced by a reservoir. Partial compensation may be achieved by acquiring approximately 150 linear miles of lands averaging 100 feet in width adjacent to streams of known high quality steelhead trout fishing, such as Grande Ronde in Oregon and Washington, Salmon and Clearwater Rivers in Idaho, and Tucannon River in Washington and reserving them for public fishing access. Estimated acquisition cost of private lands along these rivers to accommodate 130,000 angler-days annually is $2,700,000. Estimated cost for developing public access to these areas is $1,500,000; estimated annual maintenance and replacement is $30,000.

To maintain the representative number of steelhead trout in the Snake River system and to offset the loss of downstream migrants through the turbines at the four dams, artificial propagation facilities capable of producing 55,100 adults from 7,200 adults would be necessary. Acquisition of a hatchery site at the best available water supply in the upper Snake River system would be necessary. Smolts could be hauled to Snake tributary streams in Idaho, Washington, and Oregon for liberation, thus supplementing natural production and maintaining sport fishing for anadromous fish in streams affected by the projects.

Estimated capital cost for the steelhead trout hatchery and rearing facilities is $18,140,000. Estimated annual, operation, maintenance, and replacement costs are $834,000. These costs include the acquisition of 100 acres of land for hatcheries.

Estimated capital cost for steelhead trout collection, holding, and eyeing facilities is $819,000. Annual operation, maintenance, and replacement costs are estimated at $95,000.

Resident Fish

The stream fishery for resident fish within the project area, prior to 1950, was relatively undeveloped. Since then, the interest and utilization of the sport fish resources in lower Snake River have increased greatly.

With development of slackwater navigation on Columbia and Snake Rivers to Lewiston, Idaho, and hydroelectric projects on middle Snake River from Hells Canyon Dam to Weiser, Idaho, the 351 miles of stream fish habitat in the Snake have been reduced more than 50 percent. With ultimate development of all authorized projects on Snake River, within the project area of influence, only 15 percent of the river system will remain as freeflowing stream. As a result of these developments and conditions, the ever-increasing amount of sport fishing effort for resident species in Snake River has been restricted and confined to the greatly reduced amount of remaining stream fishery habitat.

Increasing human population with its demand for high quality fishing opportunities will undoubtedly result in additional fishing pressure on streams tributary to Snake River within the project area.

The loss of quality stream fishery for smallmouth bass, white sturgeon, and channel catfish in the project area cannot be totally offset. However, 45,000 angler-days could be provided by supplementing the stocking programs of Washington Department of Game, and Idaho Fish and Game Department. Stocking of catchable size trout in streams such as Tucannon, Touchet, Walla Walla, and Clearwater Rivers, and Mill and Asotin Creeks could create a higher quality fishery than presently exists in these tributaries.

With construction of a new hatchery or enlargement of existing artificial fish propagation facilities in the Snake River system and proper management, the fisheries in streams tributary to the project area could be improved to offset 45,000 angler-days of fishery losses within this area.

Estimated capital cost for a new hatchery would be $1,275,000. Annual operation, maintenance, and replacement costs are estimated at $96,000.

Wildlife

The wildlife plans presented in U. S. Fish and Wildlife Service reports on Ice Harbor, Lower Monumental, and Little Goose Lock and Dam projects were based on management of small tracts of land scattered along the projects' reservoirs. These wildlife management plans were not implemented because of adverse factors such as the Corps' "interim use" concept (wildlife use permitted until a "higher use" i.e., industry was found for the area) and lack of project funding for development, operation, maintenance, and replacement of wildlife measures designed to minimize losses.

Development of artificial nesting sites, provision of grazing pastures for Canada geese, and plantings of woody vegetation for nongame wildlife, fur animals, and big game should provide considerable onsite mitigation of wildlife losses. However, substantial reduction of upland game losses will depend largely upon control and development of suitable habitat on nonproject lands. Alternative or additional means to offset wildlife losses may be required. All measures and studies designed to reduce project-incurred wildlife losses should be funded by the projects. Measures designed to minimize such losses are as follows:

Habitat Preservation

Opportunities to replace the extensive wildlife habitat destroyed by the projects are limited. Remaining native vegetation located in side draws and along the reservoirs should be preserved. Plans for retention of remaining wildlife habitat should be cooperatively developed by Corps of Engineers, Washington Department of Game, Idaho Fish and Game Department, and the Bureau of Sport Fisheries and Wildlife.

Pollution Control

Loss and damage to fish and wildlife habitat should be minimized by careful placement of spoil from project construction and maintenance activities. No pesticide or herbicide should be used without consultation with wildlife agencies because of the harmful effects of some chemicals on fish and wildlife. The pollution control plan should be cooperatively developed by the State and Federal agencies responsible for natural resource conservation and Federal and State public health agencies.

Habitat Control, Development, and Management

Project lands not inundated will provide fair opportunities to offset big game, fur animal, nongame wildlife, and waterfowl losses with appropriate zoning and development. Significant mitigation of upland game losses will require control, intensive development, and stocking of offsite lands or comparable measures. Development, operation, maintenance, and replacement costs for all wildlife management proposals should be the projects' responsibility. Proposed habitat management plans for reducing project-incurred losses are:

A. Wildlife Management Plans for Project Lands

(1) Study Plan for Big Game, Fur Animals, and Nongame Wildlife.

A comprehensive study of project lands is required to formulate a habitat development plan for big game, fur animals, and nongame wildlife. Results would facilitate inclusion of appropriate wildlife measures in overall plans for beautification and other project requirements.

Project lands and waters to undergo habitat development study should include areas considered amenable to wildlife use. Areas utilized for industrial, port facilities, and similar commercial purposes would be excluded from consideration. Most other land use catagories, including recreational, and multi-purpose may present opportunities for compatible wildlife uses.

Plantings of suitable grasses, shrubs, and trees at favorable sites along the reservoirs is believed to offer the best potential for upgrading this habitat. Numerous parcels of land are associated with each reservoir. They all have different characteristics including soil types and depths; elevations above water; accessibility; and strategic location in relation to parks, sidehill draws, and tributary streams. The study plan would determine the most feasible and productive development program for available project lands for partially offsetting substantial project-incurred losses to fur animals, big game, and nongame wildlife. Potentials for upland game habitat management on project lands are limited.

The proposed study would start as soon as project funds are available and extend over a three-year period and would be conducted cooperatively by Bureau of Sport Fisheries and Wildlife, Washington Department of Game, Idaho Fish and Game Department, and Corps of Engineers. The study would cost an estimated $60,000.

(2) Big Game Management Plan. The plan for minimizing big game losses would involve the planting and establishment of shrubs and trees in plantations at select sites along the reservoirs to provide food and cover. These plantings, consisting of such shrubs as serviceberry, chokecherry, and hawthorn, would be made on those project lands determined most suitable by the aforementioned study. Some development work would be required such as fencing against beaver and rabbit depredations and establishing watering systems to assure initial success of the plantings. The plantings would also help beautify the reservoirs and minimize deer depredation problems at parks and other recreation lands.

The amount of money to be allocated to deer habitat development and management on project lands will depend upon the findings of the proposed three-year study of these lands.

(3) Fur Animal Management Plan. Plantings should be made in plantations at select sites along the reservoirs for the purpose of offsetting beaver losses by establishing a food supply. Incidental benefits to other fur animals would occur. The plantings would consist of cultivated saplings of several species and willow cuttings. Additionally, the plantings would beautify and provide limited habitat for songbirds and other wildlife provided berry and seed producing plants are included. Replacement of the destroyed beaver food supply coupled with a trapping program would provide a means to control beaver damage to shrubs and trees planted for other purposes such as parks. This has been a long-standing problem of Corps of Engineers and Washington Department of Game. The managed beaver population would have a high esthetic value to the public with minimal adverse impact on other project values.

The estimated cost of measures designed to restore and maintain original beaver numbers located along lower Snake River would be about $4,000,000. The Bureau of Sport Fisheries and Wildlife does not consider the funding of such a venture reasonable or in the public's interest. The Bureau would support maintenance of a limited beaver population as determined by the aforementioned study of project lands.

(4) Nongame Wildlife Management Plan. Nongame wildlife losses could be partially offset by planting suitable shrubs and trees along the reservoir. Plans for project parks and other strategic

public use sites should make provisions for such plantings to assure maximum public enjoyment of wildlife resources. The plantings would supplement shade tree and beautification measures. With proper cultivation and irrigation, the localized green belts would provide habitat for a variety of songbirds and other nongame wildlife as well as some game animals. The amount of money to be allocated to nongame wildlife habitat development and management will depend upon the findings of the proposed three-year study of project lands.

The estimated costs of a realistic wildlife management program for big game, fur animals, and nongame wildlife on project lands are $2,270,000. This includes costs for studies, operation, maintenance, and replacement during an initial five-year development period. Funds should be made available for habitat development as study findings permit. The projects would assume operation, maintenance, and replacement costs as a part of park and public use operational costs after the above development period. Washington Department of Game under agreement with Corps of Engineers would be responsible for habitat development and maintenance.

(5) Study and Management Plans for Waterfowl. The plan would be designed to develop ways and means of offsetting the loss of Canada goose nesting and rearing habitat caused by the reservoirs. Goose production may be increased through the installation of artificial nesting structures, creation of small islands, and development of grass grazing areas.

During 1969, Corps of Engineers, Washington Department of Game, Washington State University, and Bureau of Sport Fisheries and Wildlife initiated a preliminary cooperative study at several sites along impounded and remaining freeflowing reaches of lower Snake River to determine if means to increase goose nesting production were possible on the reservoir system as compared to a freeflowing river. During 1970, the effectiveness of about 40 goose-nesting structures and several manmade islands were evaluated. Results to date have been largely negative but are considered inconclusive and premature because of disturbance by project activities.

The plan would extend the joint study for not less than a five-year period. The study would determine the effectiveness of artificial nesting structures and/or islands and development of adjoining parks, forage crops, and farm pastures as a feasible means of producing geese. The extended study, to be conducted cooperatively by Washington Department of Game and Washington State University in consultation with Bureau of Sport Fisheries and Wildlife and Corps of Engineers, would cost an estimated $100,000. Estimated capital expenditures for installation, maintenance, and replacement of structures, islands, and other

measures during the project life would be about $201,250. Annual operation, maintenance, and replacement costs are estimated at $5,000. These funds would be allocated on the basis of study findings. Funds should be made available for habitat development as study findings permit.

B. Wildlife Management Plans for Nonproject Lands

Management of selected offsite areas in the vicinity of the four-dam project area would reduce most project-incurred upland game losses. Limited reduction of big game, waterfowl, fur animal, and nongame wildlife losses is also anticipated with these measures. Excessively high costs, estimated at several times those for the comparable offsite plan, and lack of enough development sites, dictates against use of project lands for other than limited upland game management purposes. Other means to attain comparable compensation for upland game losses must be developed as a project feature if the following proposals are not accepted. A possible alternate plan would be congressional funding to provide Washington Department of Game with the capability to offset inundated or otherwise destroyed habitat by lower Snake River projects. Compensation actions would be done through cost reimbursement contracts with the Bureau of Sport Fisheries and Wildlife and the State of Washington.

The following wildlife plans on nonproject lands are proposed:

(1) Control, development, and under-gun game bird stocking of selected nonproject lands along specific streams to offset most upland game bird hunting losses. Six areas comprising a total of 14,920 acres were deemed adequate as a major element of the overall wildlife management plan. About 660 acres would be acquired in fee and the remaining 14,260 acres would be operated under perpetual easements with the landowners. The in-fee land would serve as a nucleus to be intensively managed and would be surrounded by the easement lands. This measure would assure public access and suitable wildlife habitat without significantly changing the basic economy of the farms involved.

The units would be readily accessible to major human population centers. The sites chosen for inclusion in the wildlife management plan would have a high potential for upgrading of habitat to support increased game populations. They would be managed for intensive public use through large-scale stocking. Also, some losses to other wildlife forms would be offset by habitat measures.

Specific parcels of land designed for inclusion in the wildlife management plan would be dependent upon finding willing sellers. Therefore, the above described examples of development sites are presented here only to indicate the extent of this management plan.

If landowners object to acquisition or leasing, other landowners holding comparable areas would be approached. Land leasing and acquisition for wildlife management purposes would be carried out cooperatively by Corps of Engineers and Washington Department of Game.

In-fee acquisition of 660 acres needed for implementation of the above described wildlife plan would cost an estimated $328,500. This land would require development such as fencing, cattle guards, roads, parking, turnouts, cover crop plantings, and water supplies. The estimated cost of development is $146,200, with estimated annual operation, maintenance, and replacement expenses of $5,350. The cost of perpetual wildlife easements on 14,260 acres of private lands is estimated at $1,069,000 for the project life. Land controlled by acquisition and under perpetual easement would require annual stocking of game farm birds.

(2) Installation of watering devices and development of springs and natural drainages at strategic sites on adjoining lands for use by upland game (principally chukars). The plan would expand game bird range where lack of water is the limiting factor. Site selection would be based upon wildlife studies carried out over a two-year period on uplands bordering the four-dam complex. They would be conducted cooperatively by Bureau of Sport Fisheries and Wildlife and Washington Department of Game. Ultimate site selection would depend upon study findings. Preliminary investigations indicate the need for installation of 50 to 75 cisterns and development of a few springs and natural drainages. Cisterns, small check dams, and protective fencing would be required. Use of supplementary pumping facilities may be feasible.

Landowner agreements in the form of perpetual easements for public access would be required to insure site maintenance and public access with the cistern and waterway plans. Estimated study costs would be $20,000. Capital costs for cistern installation, waterway development, and fencing are estimated at $16,250. Estimated operation, maintenance, and replacement costs would be $500. Washington Department of Game would be responsible for OM&R through project funds transferred from Corps of Engineers. Perpetual easement costs for public access to 32,000 acres of land anticipated with wildlife water development are estimated at $120,000. Easements would be obtained by Corps of Engineers in cooperation with Washington Department of Game and Bureau of Sport Fisheries and Wildlife.

(3) A game farm should be constructed in the project vicinity and managed to provide upland game birds for annual stocking of proposed offsite wildlife management units. It would be designed to occupy about 160 acres of productive land. Estimated capital cost of the facility to rear about 20,000 pheasants annually would be $1,000,000, and annual operation, maintenance, and replacement costs are estimated at $68,000. Washington Department of Game would assume management responsibility. An alternate plan to attain a comparable degree of loss compensation should be designed and implemented as a project function if the game farm plan is not accepted as a project feature or is used as a temporary measure until habitat development is adequately accomplished.

The wildlife management plan would be cooperatively developed by the Bureau of Sport Fisheries and Wildlife and Washington Department of Game. Capital, operation, maintenance, and replacement costs over the 100-year life of the four-dam complex would be a Federal responsibility and would be funded by the projects.

Full implementation of the wildlife mitigation plan would offset, in terms of human use, most big game losses, upland game and waterfowl losses. In terms of wildlife populations, the plan would reduce substantially fur animal and nongame wildlife losses. However, reduction of wildlife losses through implementation of measures recommended herein would not offset severe project-caused losses of irreplaceable wildlife environment and related human use opportunities.

Estimated costs of the proposed wildlife mitigation plan are summarized in table 6.

Table 6. Estimated Costs of Measures Needed to Reduce Project-Incurred Wildlife Losses, Lower Snake River Projects

Measure	Costs	
	Capital	Annual OM&R
Project Areas		
Wildlife Management Plan		
3-year study	$ 60,000	
Wildlife habitat development	2,370,000 1/	
Subtotal	$2,430,000	
Waterfowl Management Plan		
5-year study	$ 100,000	
Island and pasture development	200,000	
Goose-Nesting platforms	1,250	
Combined OM&R		$ 5,000
Subtotals	$ 301,250	$ 5,000
Nonproject Areas		
Water Supply Plan		
2-year study	$ 20,000	
Watering devices (65 @$250)	16,250	$ 500
Perpetual land easements (32,000 A)	120,000	
Wildlife Management Areas		
Land purchases (660 A)	328,500	
Land leases (14,250 A)	1,069,000	
Developments (plantings, etc.)	146,000	5,350
Game farm	1,000,000 2/	68,000 3/
Subtotals	$2,699,950	$ 73,850
Totals	$5,431,200	
Contingencies 15%	814,680	
Grand Totals	$6,245,880	$ 78,850

1/ Includes $40,000 OM&R annually to be expended during initial five years. OM&R to be assumed by Corps of Engineers as project operation cost following initial five-year period.
2/ Includes cost of 160-acre irrigated farm at $140,000.
3/ Cost of stocking game farm pheasants $3,40 each.

RECOMMENDATIONS

It is recommended that:

1. project funds be provided to finance construction and annual operation, maintenance, and replacement costs for artificial fish propagation, collection, and transportation facilities, capable of producing and transporting adequate numbers of salmon and steelhead trout smolts to offset project-related fish losses in the Snake River system. Estimated total capital cost of facilities is $33,646,000 and estimated annual operation, maintenance, and replacement costs $1,775,000, allocated in the following manner:

   a. construction of fish propagation facilities, in the Columbia River system downstream from Ice Harbor Dam, capable of collecting and rearing the progeny from 8,800 adult fall chinook salmon. Estimated construction cost of hatchery facilities is $4,360,000 and estimated annual costs of operation, maintenance, and replacement would be about $244,000. Estimated cost of necessary equipment for collecting, holding, and transporting fish is $935,000, with estimated annual operation, maintenance, and replacement costs of $50,000.

   b. construction of hatchery and rearing facilities in the upper Snake River system for the progeny of 3,800 adult spring and summer chinook salmon. Estimated construction cost of hatchery and rearing facilities is $8,960,000 and estimated annual operation, maintenance, and replacement costs would be $502,000. Construction would include facilities for collection, eyeing, holding, and transportation of 3,800 adult spring and summer chinook salmon and their progeny. Estimated construction cost is $432,000 and estimated annual operation, maintenance and replacement costs would be about $50,000.

   c. construction of steelhead trout hatchery facilities in the upper Snake River system to rear the progeny from 7,200 adult steelhead trout. Estimated construction cost of hatchery facilities is $18,140,000 and estimated operation, maintenance, and replacement costs are about $834,000. Construction of collection, eyeing, holding, and transportation facilities on Snake River tributaries to handle 7,200 adult steelhead trout would cost an estimated $819,000. Estimated annual operation, maintenance, and replacement costs are $95,000.

2. hatchery, rearing, holding, and transportation facilities be constructed in the Snake River system to rear 85,000 pounds of rainbow trout at three fish per pound to supplement the Washington Department of Game and Idaho Fish and Game Department stream fishery management programs. Estimated construction of hatchery facilities is $1,275,000 and estimated annual operation, maintenance, and replacement costs are about $96,000.

3. To partially compensate for losses to stream sport fishery for steelhead trout a minimum of 150 linear miles of streamside land, averaging 100 feet in width, along Grande Ronde River in Oregon, Salmon and Clearwater Rivers in Idaho, and Tucannon River in Washington, be acquired primarily for public fishing areas. Location of land strips to be determined cooperatively by fishery agencies of Washington, Oregon, and Idaho. Estimated cost of land acquisition is $2,700,000. Estimated development cost is $1,500,000 with annual operation, maintenance, and replacement costs estimated at $30,000. It is suggested that these lands be acquired as they become available. If it becomes evident that acquisition of land does not keep pace with the demand, other means of compensation should be developed.

4. a. the projects provide an estimated $60,000 for a three-year study designed to formulate a habitat development plan for big game, fur animals, and nongame wildlife on project lands. The study would be conducted cooperatively by Bureau of Sport Fisheries and Wildlife, Washington Department of Game, and Corps of Engineers.

   b. estimated project funds in the amount of $2,370,000 be made available to Washington Department of Game and Bureau of Sport Fisheries and Wildlife for development of wildlife habitat on project lands. Fund disbursement would be made on the basis of study findings outlined in recommendation 4a. The annual OM&R costs are estimated at $40,000 for the initial five-year period. Following this period the OM&R costs would be assumed by the projects as a function of their normal operation and in conjunction with other park and recreational plantings.

5. a. the projects provide an estimated $100,000 for a five-year study designed to formulate a waterfowl habitat development plan on projects' area. The study would be conducted cooperatively by Washington Department of Game and Washington State University in consultation with Bureau of Sport Fisheries and Wildlife and Corps of Engineers.

b. estimated project funds in the amount of $201,250 be made available to Washington Department of Game and Bureau of Sport Fisheries and Wildlife for development, operation, maintenance, and replacement of waterfowl habitat on projects' lands and waters. These funds would be allocated on the basis of the study findings outlined in recommendation 5a. Estimated annual operation, maintenance, and replacement costs would be $5,000.

6. a. the projects provide an estimated $20,000 for a two-year study designed to upgrade habitat for upland game birds on lands in the vicinity of the projects. Suitable sites would be located and watering devices and water control structures would be constructed and evaluated to determine their effectiveness in offsetting project-incurred losses. Washington Department of Game and Bureau of Sport Fisheries and Wildlife would jointly conduct the study.

b. estimated project funds in the amount of $16,250 be made available for installation of about 65 watering facilities to be located on lands adjoining the projects as determined by the study outlined in recommendation 6a. Annual operation, maintenance, and replacement would be project costs estimated at $500. Washington Department of Game would be responsible for OM&R through the transfer of project funds from Corps of Engineers.

c. estimated project funds in the amount of $120,000 be made available for acquiring perpetual public access easements on 32,000 acres of rangeland surrounding the installed watering devices as determined by study recommendation 6a. Corps of Engineers in cooperation with Washington Department of Game and Bureau of Sport Fisheries and Wildlife would obtain the necessary easements.

7. an upland game management program be undertaken with project funds to offset project-incurred upland game losses. The program would include land acquisition of about 660 acres costing $328,500. About 14,260 acres of land surrounding the land parcels acquired in fee would be placed in perpetual easement status under landowner agreements at an estimated cost of $1,069,000. Habitat development costs for all management lands are estimated at $146,200 with annual operation, maintenance, and replacement amounting to about $5,350. Washington Department of Game would be responsible for initiating and managing this program with project funds.

8. a game bird farm be constructed (or suitable alternate provided) in the projects' vicinity and managed for stocking the wildlife management units proposed in recommendation 7. This facility would

have an estimated capital cost of $1,000,000 and annual operation, maintenance, and replacement costs estimated at $68,000. These costs designed to mitigate project-incurred losses are considered to be a project responsibility. Washington Department of Game would assume management responsibilty.

9. destruction of vegetation on project lands be held to a minimum. Plans for vegetation retention be cooperatively developed by Corps of Engineers, Washington Department of Game, Idaho Fish and Game Department, and Bureau of Sport Fisheries and Wildlife.

10. Corps of Engineers' placement of spoil and programs using herbicides and pesticides on project lands or waters be evaluated in cooperation with Environmental Protection Agency, Bureau of Sport Fisheries and Wildlife, National Marine Fisheries Service, Washington Departments of Fisheries and Game, and Idaho Fish and Game Department.

11. in accordance with the February 12, 1972, Joint Policy of the Departments of the Interior and the Army, relative to reservoir project lands and waters, all project lands and waters that are of value for fish and wildlife management as may be mutually determined by Corps of Engineers, Bureau of Sport Fisheries and Wildlife, and Washington Department of Game, should be made available to Washington Department of Game under terms of a General Plan and subsequent cooperative agreement.

12. a zoning plan be developed to assure equitable use of the reservoir and adjacent lands for fishing and hunting as well as other recreational purposes. Such a plan should be developed by Corps of Engineers in cooperation with Bureau of Sport Fisheries and Wildlife, National Marine Fisheries Service, Bureau of Outdoor Recreation, Washington Department of Fisheries, Washington Department of Game, and Idaho Fish and Game Department.

13. such reasonable modifications be made in the authorized projects' facilities and operations as may be agreed upon by Directors of the Bureau of Sport Fisheries and Wildlife, National Marine Fisheries Service, Washington Departments of Fisheries and Game, Idaho Fish and Game Department, and Chief of Engineers, for conservation, improvement, and development of fish and wildlife resources.

14. Federal lands and project waters in the project areas be open to the public for hunting, fishing, and related recreation uses except for areas reserved for safety, efficient operation, or protection of public property, or those areas where closures may be found necessary by Washington Department of Fisheries, Washington

Department of Game, National Marine Fisheries Service, and Bureau of Sport Fisheries and Wildlife to conserve and/or develop fish and wildlife resources.

15. leases of Federal lands in the project areas assure the right of public use of such lands for hunting, fishing, and related activities.

Appendix - Cost Estimate for Spring and Summer Chinook Hatchery Program 1/

To illustrate the methods of calculating the various parameters and costs, the procedure will be followed in detail for spring and summer chinook. Calculations for other species have been determined similarly.

Table 2 indicates a representative value of 122,200 spring and summer chinook passing Ice Harbor Dam. It has been noted that smolt mortalities, (percentagewise) can be translated directly into adult mortalities, and that a 15 percent smolt loss per dam would result in a cumulative 48 percent for the four dams. Consequently, 48 percent of 122,200 adults indicates that 58,700 adults would be required to counter the loss.

To produce 58,700 adults would require a hatchery to handle 1,900 females and then demonstrate that this is the case. Calculations are given in the following table:

Adult female requirement (3,800; 50% female)	1,900
Eggs needed at 5,000 per female	9,500,000
Smolts needed at 70% survival	
Numbers	6,720,000
Pounds at 15 per pound	448,000
Adult return at 0.61% survival	58,700
Capital cost at $20,00 per pound of smolts	$8,960,000 1/
OM&R at $1.12 per pound of smolts	$ 502,000 1/

Engineers have estimated that collecting, eyeing, holding, and transportation will entail estimated capital costs of $432,000 and OM&R of $50,000.

1/ These estimates of cost were prepared in 1968; substantial increases can be anticipated at time of construction.

IDAHO FISH AND GAME DEPARTMENT

POST OFFICE BOX 25
600 SOUTH WALNUT STREET
BOISE, IDAHO 83707

January 17, 1972

Mr. John D. Findlay, Regional Director
Bureau of Sport Fisheries and Wildlife
P. O. Box 3737
Portland, Oregon 97208

Dear John Mr. Findlay:

We have reviewed the Bureau of Sport Fisheries and Wildlife draft report on the Corps of Engineers Lower Snake River Dam project and have the following comments.

Page 5, paragraph 2, last sentence--"and private" should be inserted between "Federal" and "dams".

Page 5, paragraph 3--nitrogen supersaturation should be added as a major pollutant.

Page 8, last paragraph, first sentence, and Page 9, first partial paragraph, third sentence--we suggest substituting "minimize" for "offset".

Page 12, last paragraph, sentence 2--brown trout should be included among the less important resident game fish species.

Page 15, paragraph 3--In our opinion the difference between angler days use on the river and on the reservoir would be much greater than the 45,000 days indicated.

Page 17, first partial paragraph, second complete sentence--suggest the word "conceivably" be substituted for "feasibly". Action by the Idaho Fish and Game Commission approving relocation of the fall chinook run contained several conditions and qualifications. While there is no reason to believe these conditions and qualifications cannot be met in the future, they have not been resolved to date.

Page 33, first paragraph, sentence 3--dissolved nitrogen is not technically completely cumulative from one project to the next.

Page 51, item 1, sentence 1--we suggest insertion of the words "project related" between "offset" and "fish".

Page 58, item 13--The Director of the Idaho Fish and Game Department should be included as one of the parties acting on the recommended modifications.

Wildlife

We disagree with the statements contained in the first two sentences under "B" on pages 45 and 46 and the first sentence under (1) on page 46. It is our conviction that the recommended mitigation measures or any other feasible measures will not significantly compensate for wildlife losses due to impoundment. Project involved wildlife resources are minimal in Idaho, however, and we will defer detailed comment to the Washington Department of Game.

We appreciate the opportunity of reviewing this draft report. The importance of initiating measures for compensation of fish and wildlife, particularly anadromous fish, cannot be overemphasized.

It appears to us that there may conceivably be difficulties in resolving the wildlife issue pointed out in the report. If these difficulties should arise we would urge that, if possible, the urgently needed anadromous fish compensation measures be pursued independently of the wildlife phases. In view of present project related losses occurring in the Snake River anadromous fish runs, it is imperative that action to return the runs to pre-project levels be initiated as soon as possible.

Sincerely,

IDAHO FISH AND GAME DEPARTMENT

Joseph C. Greenley
Director

cc: BSFW, Spokane

FISH COMMISSION

OFFICE OF THE DIRECTOR

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Member

January 14, 1972

Mr. John D. Findlay
Regional Director
Bureau of Sport Fisheries and Wildlife
Post Office Box 3737
Portland, Oregon 97208

Dear John:

We have reviewed the draft report entitled "A Special Report Presenting Plans to Mitigate Fish and Wildlife Losses Caused by Ice Harbor, Lower Monumental, Little Goose and Lower Granite Lock and Dam Projects".

Members of our staff have participated in preparation of this report. We are familiar with its contents and concur in them. The anadromous fishery portion of the report is unprecedented in that it seeks compensation for upstream and downstream fish passage losses at the four Snake River projects as well as losses for inundated spawning area. Past compensation efforts have been confined to losses of spawning area inundated or blocked by dam construction because of the extreme difficulty of evaluating upstream and downstream passage losses.

It is urgent that processing of this report be completed as soon as possible. It has been understandably complex to prepare and has been delayed several times because of this and other reasons. We have recently heard there may be problems with the wildlife section of the report which could cause further delay. If this is true, we would suggest that you consider separating the fish from the wildlife section of the report so the fishery section can be submitted and processed without delay.

We believe implementation of the recommendations in this report in essentially their present form is extremely important as regards salvation of the troubled Columbia River anadromous fish runs. Funding of this program is almost as critical as resolution of the nitrogen supersaturation problem. We ask that your bureau alert appropriate conservation groups

to support this report in Washington, D.C. and that it keep these groups and the concerned fish and game agencies fully apprised of how this report is faring as it moves through the various levels of governmental decision makers in this area and the capitol.

We appreciate the opportunity to review this report.

Sincerely,

Thomas E. Kruse

THOMAS E. KRUSE, ACTING
STATE FISHERIES DIRECTOR

cc Bureau of Sport Fisheries and Wildlife, L. Edward Perry
Cannon, Kessler
Corps of Engineers, North Pacific Division
Corps of Engineers, Walla Walla District
Idaho Fish and Game Department, Monte Richards
Northwest Steelheaders, Bill Luch
Oregon Division, Izaak Walton League, James Potter
Oregon State Game Commission, William Pitney
Oregon Wildlife Federation, George Reed
Washington Department of Fisheries, William Rees
Washington Department of Game, John Douglas

GAME COMMISSION

OFFICE OF THE DIRECTOR

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State Game Director

January 25, 1972

Mr. John D. Findlay
Regional Director
Bureau of Sport Fisheries & Wildlife
P. O. Box 3737
Portland, Oregon 97208

Dear Mr. Findlay:

We have reviewed your special report to the Corps of Engineers to compensate for fish and wildlife losses caused by the lower Snake River dams. We have only one comment.

On page 17, the second paragraph concerns hatchery capability to return 50,700 spring-summer chinook adults upstream from Lower Granite dam. The appendix states that smolts would be released at 15 to the pound. Our experience has been that smolts between 6 and 8 per pound yield much higher returns of adult fish. This significantly reduces the number of smolts that need to be reared.

We thank you for the opportunity to review this report.

Sincerely yours,

John W. McKean
Director

cc Fish Commission of Oregon
River Basin Studies - Spokane

WASHINGTON
Department of
FISHERIES

DANIEL J. EVANS
GOVERNOR

ROOM 115, GENERAL ADMINISTRATION BUILDING • PHONE 753-6600
OLYMPIA, WASHINGTON 98504

THOR C. TOLLEFSON
DIRECTOR

February 7, 1972

Mr. John D. Findlay
Regional Director
Bureau of Sport Fisheries and Wildlife
Post Office Box 3737
Portland, Oregon

Dear Mr. Findlay:

We are pleased that your report, "A Special Report Presenting Plans to Mitigate Fish and Wildlife Losses Caused by Ice Harbor, Lower Monumental, Little Goose and Lower Granite Lock and Dam Projects" is nearing completion. The preparation of the report has taken considerable time and effort but in view of the importance of the resources involved and the interests of the various fish and wildlife agencies we feel it was justified. Further, the present plan has the advantage of the latest knowledge and technology and therefore should present the best opportunity for preserving for future generations the valuable runs of Snake River salmon and steelhead.

We appreciated the opportunity to review and contribute to the report and we concur with your November, 1971 draft. We are anxious to see the plan implemented and, if we can be of further assistance, please call on us.

Sincerely,

Thor C. Tollefson

Thor C. Tollefson
Director

cc: Charles M. Chambers, BSF&W, Spokane

DEPARTMENT OF GAME

600 North Capitol Way / Olympia, Washington 98504

March 22, 1972

Mr. John D. Findlay, Director
Pacific Region, Bureau of Sport
Fisheries and Wildlife
1500 N. E. Irving Street
Portland, Oregon 97208

Dear John:

We have reviewed the report on the effect of Corps of Engineers' dam structures on fish and wildlife resources of the Snake River. We find the report generally lacking in figures on the fish and wildlife resources. It is unfortunate that the Corps of Engineers did not comply with the Fish and Wildlife Coordination Act and consult with the states involved so that studies could have commenced early enough to gather adequate data to obtain a true picture of the impact of the projects on fish and wildlife. It is fortunate that this Department had some data gathered on routine investigation of the area involved, or none would have been available. It is, therefore, with reluctance that we make the following comments on the report:

1. Without adequate preflooding investigations on fish and wildlife resources, limited information exists for scientific evaluation of project impact. A report on pre-existing fish and wildlife resources prepared with limited data and, in fact, after the resource has been eliminated is saddled with inherent weakness and questionable credibility.

2. The only number and distribution data included are for fish and geese. This weakness in the report affects evaluation of preflooding resources, as well as what might have been the potential without the project.

3. The use of man-days of recreation to assign basic values to a natural resource is at best faulty. It reflects economic value only and does not consider the potential use of a resource that existed in an area of limited accessibility and rugged terrain.

4. Information on non-hunted wildlife is inadequate. No population estimates are given and even a list of species is lacking. It is, therefore, difficult to evaluate losses and develop mitigation proposals for a resource that is increasingly assuming a more significant role in outdoor recreation activities.

5. No evaluation has been made as to the effect of project-related activities (railroad rights of way, borrow areas, staging sites) on the habitat of wildlife species.

6. The mere provision for escapement of 55,100 steelhead above the project does not compensate for project-related losses of fishing opportunities. Angler opportunity for steelhead has been significantly reduced by the project and merely purchasing stream bank easements on tributary streams does not solve the problem. Additional steelhead stocking in these streams will be necessary to partially compensate for losses.

7. Creel census and questionnaire data by this Department at its own expense from 1964-1970 indicate a decline in reservoir angler-days spent fishing for resident species. The projection of 205,000 annual angler-days for warm water species in the reservoir area is too high, in our opinion. Therefore, the difference between angler-days use on the river and on the reservoirs is greater than the 45,000 angler-days used.

8. Distribution of catchable trout to partially compensate for lost angler-days of fishing for resident species should be based upon where the losses occurred. Most of the lost opportunity occurs in Washington and the report does not establish the portion of these fish to be allotted to Washington.

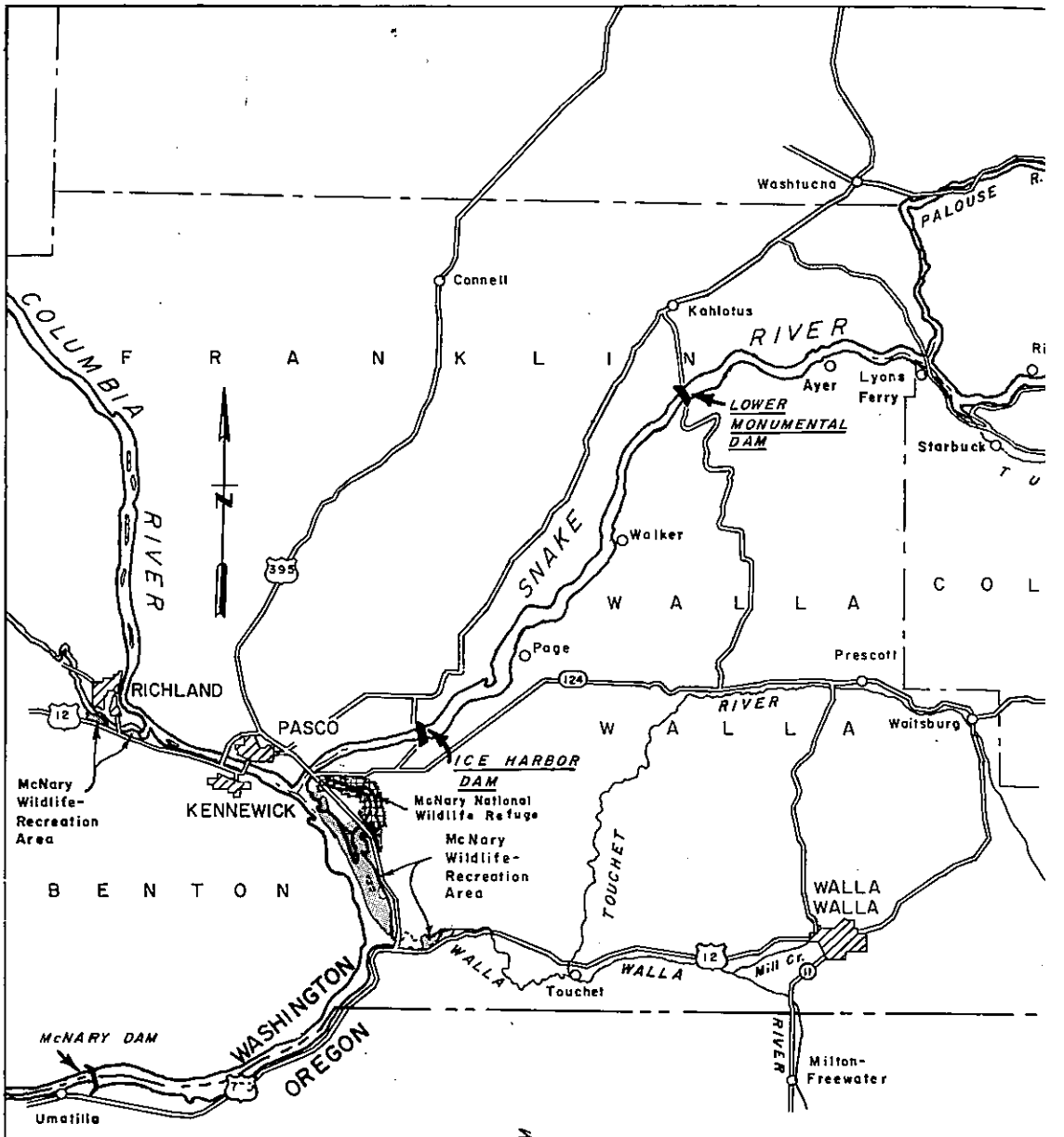
Our first reaction to your report was to not concur. However, after due consideration of the limitation on funds to accomplish development of all the fish and wildlife data needed and the constraints under which the mitigation proposals must be developed, we will reluctantly agree that the proposals presented are somewhat reasonable under the circumstances. We do not feel that true replacement of fishing and hunting opportunities in the project areas are being accomplished and at best we may expect to obtain minimal mitigation, which the plan in the report appears to do.

Very truly yours,

THE DEPARTMENT OF GAME

Carl N. Crouse, Director

CNC:mm
cc: Environmental Mgt. Division



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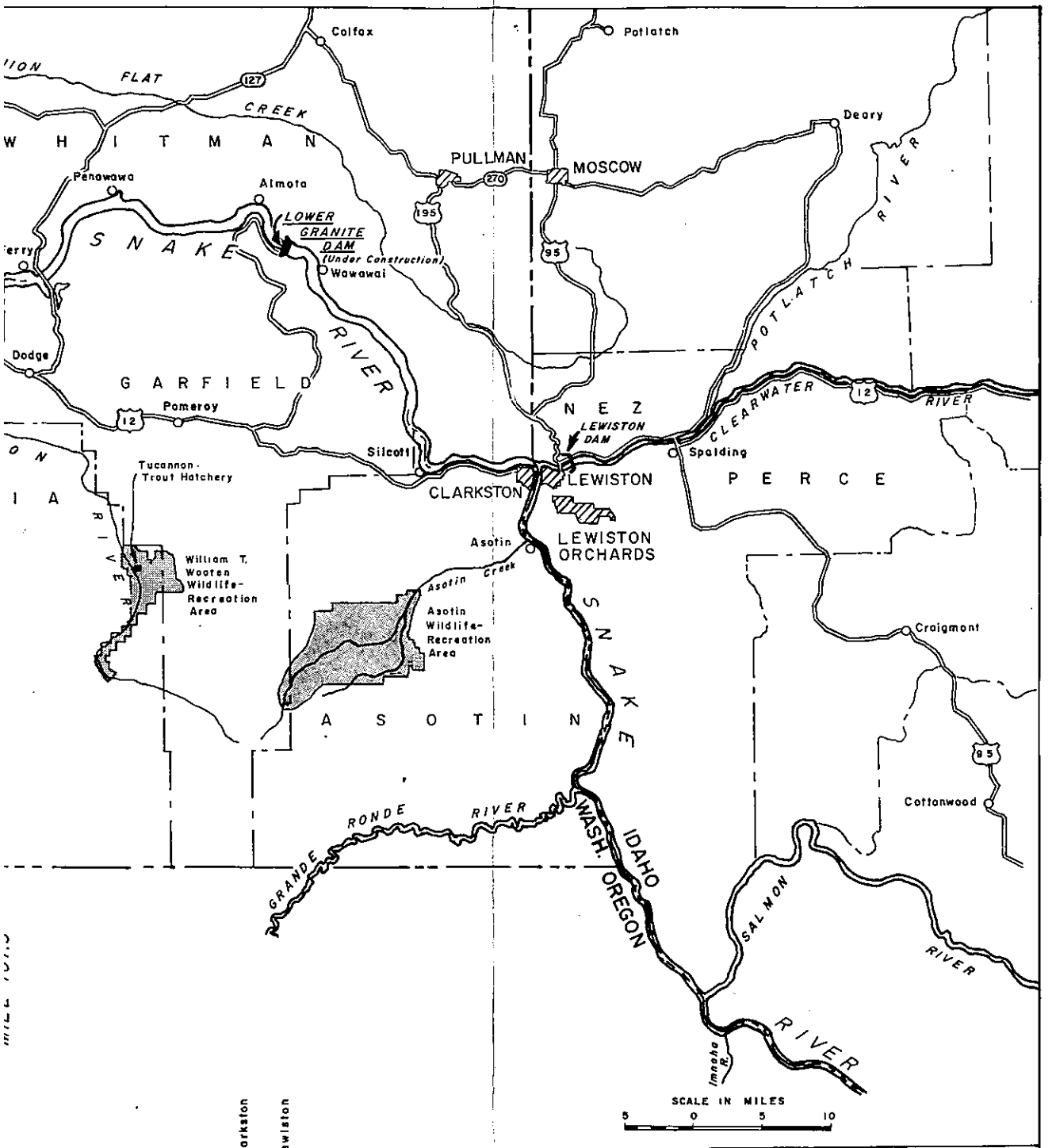

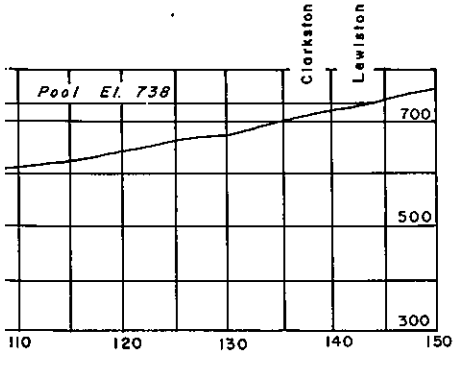

TED FROM CORPS OF ENGINEERS MAP

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF SPORT FISHERIES AND WILDLIFE

GENERAL MAP
CORPS OF ENGINEERS

LOWER SNAKE RIVER LOCK AND DAM PROJECTS

SNAKE RIVER
WASHINGTON AND IDAHO

MAY 1972

PORTLAND, OREGON