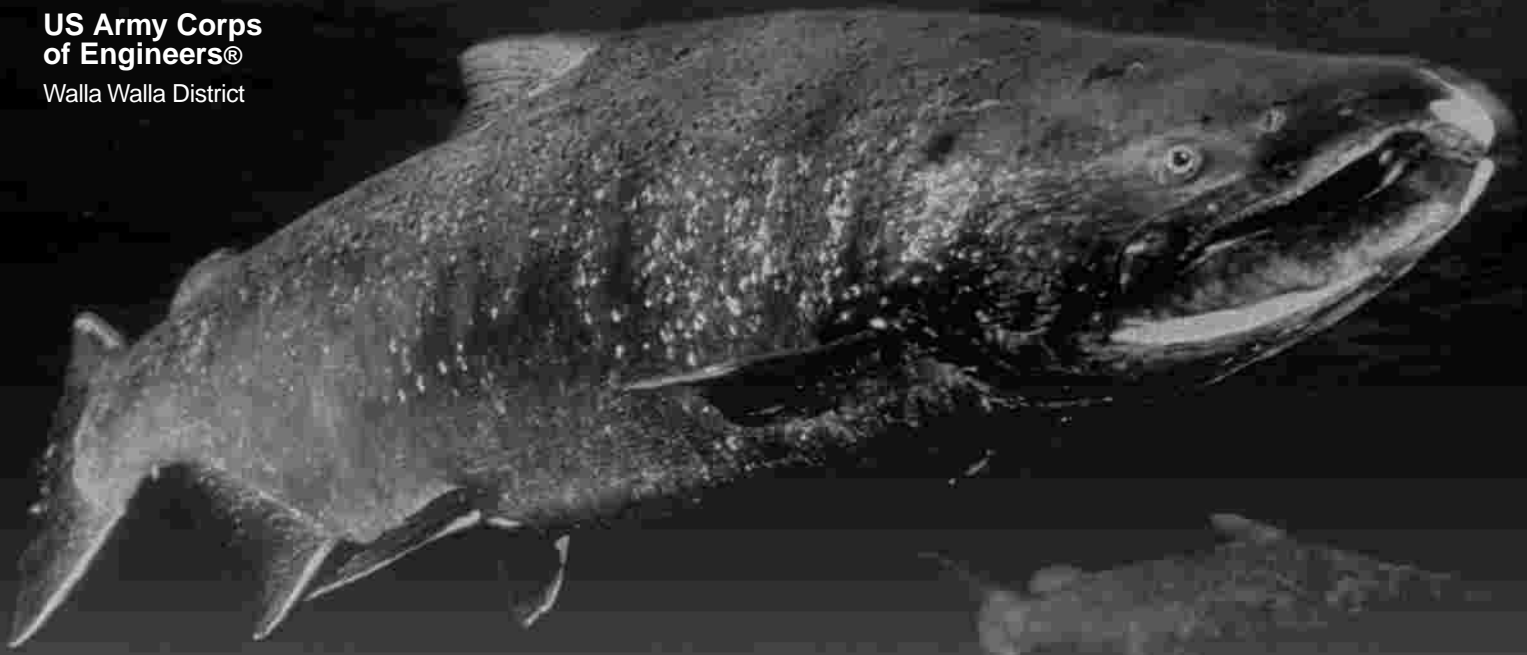




US Army Corps  
of Engineers®  
Walla Walla District



— F I N A L —

Lower Snake River Juvenile  
Salmon Migration Feasibility Report/  
Environmental Impact Statement

APPENDIX L  
**Lower Snake River  
Mitigation History and Status**

February 2002

## FEASIBILITY STUDY DOCUMENTATION

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### Document Title

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Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement

Appendix A (bound with B)	Anadromous Fish Modeling
Appendix B (bound with A)	Resident Fish
Appendix C	Water Quality
Appendix D	Natural River Drawdown Engineering
Appendix E	Existing Systems and Major System Improvements Engineering
Appendix F (bound with G, H)	Hydrology/Hydraulics and Sedimentation
Appendix G (bound with F, H)	Hydroregulations
Appendix H (bound with F, G)	Fluvial Geomorphology
Appendix I	Economics
Appendix J	Plan Formulation
Appendix K	Real Estate
Appendix L (bound with M)	Lower Snake River Mitigation History and Status
Appendix M (bound with L)	Fish and Wildlife Coordination Act Report
Appendix N (bound with O, P)	Cultural Resources
Appendix O (bound with N, P)	Public Outreach Program
Appendix P (bound with N, O)	Air Quality
Appendix Q (bound with R, T)	Tribal Consultation and Coordination
Appendix R (bound with Q, T)	Historical Perspectives
Appendix S*	Snake River Maps
Appendix T (bound with R, Q)	Clean Water Act, Section 404(b)(1) Evaluation
Appendix U	Response to Public Comments

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\*Appendix S, Lower Snake River Maps, is bound separately (out of order) to accommodate a special 11 x 17 format.

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The documents listed above, as well as supporting technical reports and other study information, are available on our website at <http://www.nww.usace.army.mil/lsr>. Copies of these documents are also available for public review at various city, county, and regional libraries.

# STUDY OVERVIEW

## Purpose and Need

Between 1991 and 1997, due to declines in abundance, the National Marine Fisheries Service (NMFS) made the following listings of Snake River salmon or steelhead under the Endangered Species Act (ESA) as amended:

- sockeye salmon (listed as endangered in 1991)
- spring/summer chinook salmon (listed as threatened in 1992)
- fall chinook salmon (listed as threatened in 1992)
- steelhead (listed as threatened in 1997).

In 1995, NMFS issued a Biological Opinion on operations of the Federal Columbia River Power System (FCRPS). Additional opinions were issued in 1998 and 2000. The Biological Opinions established measures to halt and reverse the declines of ESA-listed species. This created the need to evaluate the feasibility, design, and engineering work for these measures.

The Corps implemented a study (after NMFS' Biological Opinion in 1995) of alternatives associated with lower Snake River dams and reservoirs. This study was named the Lower Snake River Juvenile Salmon Migration Feasibility Study (Feasibility Study). The specific purpose and need of the Feasibility Study is to evaluate and screen structural alternatives that may increase survival of juvenile anadromous fish through the Lower Snake River Project (which includes the four lowermost dams operated by the Corps on the Snake River—Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dams) and assist in their recovery.

## Development of Alternatives

The Corps' response to the 1995 Biological Opinion and, ultimately, this Feasibility Study, evolved from a System Configuration Study (SCS) initiated in 1991. The SCS was undertaken to evaluate the technical, environmental, and economic effects of potential modifications to the configuration of Federal dams and reservoirs on the Snake and Columbia Rivers to improve survival rates for anadromous salmonids.

The SCS was conducted in two phases. Phase I was completed in June 1995. This phase was a reconnaissance-level assessment of multiple concepts including drawdown, upstream collection, additional reservoir storage, migratory canal, and other alternatives for improving conditions for anadromous salmonid migration.

The Corps completed a Phase II interim report on the Feasibility Study in December 1996. The report evaluated the feasibility of drawdown to natural river levels, spillway crest, and other improvements to existing fish passage facilities.

Based in part on a screening of actions conducted for the Phase I report and the Phase II interim report, the study now focuses on four courses of action:

- Existing Conditions
- Maximum Transport of Juvenile Salmon

- Major System Improvements
- Dam Breaching.

The results of these evaluations are presented in the combined Feasibility Report (FR) and Environmental Impact Statement (EIS). The FR/EIS provides the support for recommendations that will be made regarding decisions on future actions on the Lower Snake River Project for passage of juvenile salmonids. This appendix is a part of the FR/EIS.

### Geographic Scope

The geographic area covered by the FR/EIS generally encompasses the 140-mile long lower Snake River reach between Lewiston, Idaho and the Tri-Cities in Washington. The study area does slightly vary by resource area in the FR/EIS because the affected resources have widely varying spatial characteristics throughout the lower Snake River system. For example, socioeconomic effects of a permanent drawdown could be felt throughout the whole Columbia River Basin region with the most effects taking place in the counties of southwest Washington. In contrast, effects on vegetation along the reservoirs would be confined to much smaller areas.

### Identification of Alternatives

Since 1995, numerous alternatives have been identified and evaluated. Over time, the alternatives have been assigned numbers and letters that serve as unique identifiers. However, different study groups have sometimes used slightly different numbering or lettering schemes and this has led to some confusion when viewing all the work products prepared during this long period. The primary alternatives that are carried forward in the FR/EIS currently involve the following four major courses of action:

Alternative Name	PATH <sup>1/</sup> Number	Corps Number	FR/EIS Number
Existing Conditions	A-1	A-1	1
Maximum Transport of Juvenile Salmon	A-2	A-2a	2
Major System Improvements	A-2'	A-2d	3
Dam Breaching	A-3	A-3a	4

<sup>1/</sup> Plan for Analyzing and Testing Hypotheses

### Summary of Alternatives

The **Existing Conditions Alternative** consists of continuing the fish passage facilities and project operations that were in place or under development at the time this Feasibility Study was initiated. The existing programs and plans underway would continue unless modified through future actions. Project operations include fish hatcheries and Habitat Management Units (HMUs) under the Lower Snake River Fish and Wildlife Compensation Plan (Comp Plan), recreation facilities, power generation, navigation, and irrigation. Adult and juvenile fish passage facilities would continue to operate.

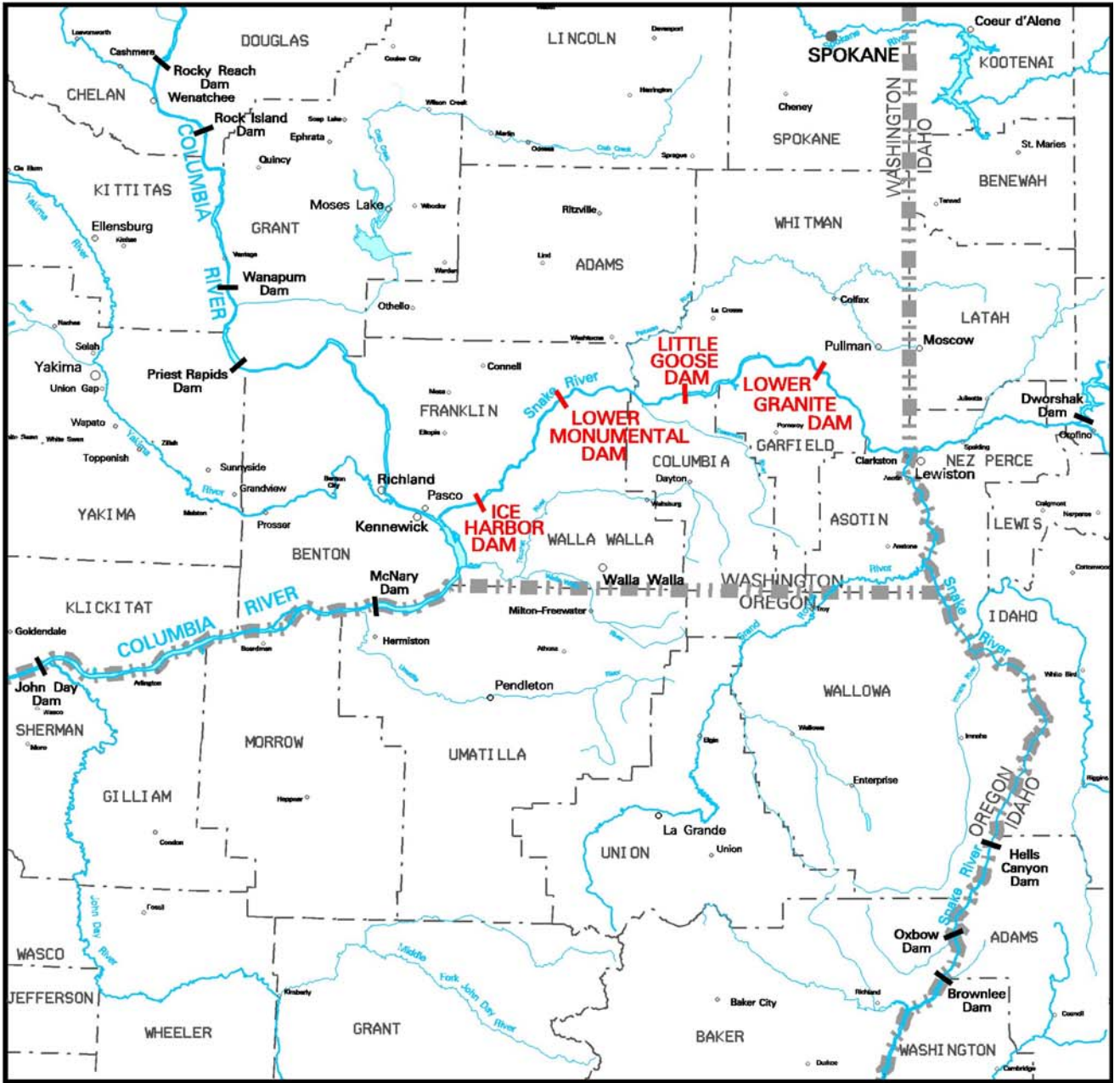
The **Maximum Transport of Juvenile Salmon Alternative** would include all of the existing or planned structural and operational configurations from the Existing Conditions Alternative. However, this alternative assumes that the juvenile fishway systems would be operated to maximize fish transport from Lower Granite, Little Goose, and Lower Monumental and that voluntary spill would not be used to bypass fish through the spillways (except at Ice Harbor). To accommodate this maximization of transport, some measures would be taken to upgrade and improve fish handling facilities.

The **Major System Improvements Alternative** would provide additional improvements to what is considered under the Existing Conditions Alternative. These improvements would be focused on using surface bypass facilities such as surface bypass collectors (SBCs) and removable spillway weirs (RSWs) in conjunction with extended submerged bar screens (ESBSs) and a behavioral guidance structure (BGS). The intent of these facilities would be to provide more effective diversion of juvenile fish away from the turbines. Under this alternative, an adaptive migration strategy would allow flexibility for either in-river migration or collection and transport of juvenile fish downstream in barges and trucks.

The **Dam Breaching Alternative** has been referred to as the “Drawdown Alternative” in many of the study groups since late 1996 and the resulting FR/EIS reports. These two terms essentially refer to the same set of actions. Because the term drawdown can refer to many types of drawdown, the term dam breaching was created to describe the action behind the alternative. The Dam Breaching Alternative would involve significant structural modifications at the four lower Snake River dams, allowing the reservoirs to be drained and resulting in a free-flowing yet controlled river. Dam breaching would involve removing the earthen embankment sections of the four dams and then developing a channel around the powerhouses, spillways, and navigation locks. With dam breaching, the navigation locks would no longer be operational and navigation for large commercial vessels would be eliminated. Some recreation facilities would close while others would be modified and new facilities could be built in the future. The operation and maintenance of fish hatcheries and HMUs would also change, although the extent of change would probably be small and is not known at this time.



### **Authority**

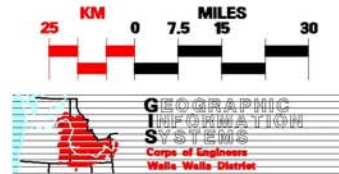
The four Corps dams of the lower Snake River were constructed and are operated and maintained under laws that may be grouped into three categories: 1) laws initially authorizing construction of the project, 2) laws specific to the project passed subsequent to construction, and 3) laws that generally apply to all Corps reservoirs.




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**BOUNDARIES**

State   
 County 



125,000 ACRES  
  
 1 : 1,900,800

**LOWER SNAKE RIVER  
 Juvenile Salmon Migration Feasibility Study**

**REGIONAL  
 BASE MAP**



**US Army Corps  
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Walla Walla District

**Final**  
**Lower Snake River Juvenile Salmon**  
**Migration Feasibility Report/  
Environmental Impact Statement**

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**Appendix L**  
**Lower Snake River Mitigation**  
**History and Status**

**Produced by**  
**U.S. Army Corps of Engineers**  
**Walla Walla District**

February 2002

## **FOREWORD**

Appendix L was compiled and written by the U.S. Army Corps of Engineer (Corps), Walla Walla District. This appendix is one part of the overall effort of the Corps to prepare the Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement (FR/EIS).

The Corps has reached out to regional stakeholders (Federal agencies, tribes, states, local governmental entities, organizations, and individuals) during the development of the FR/EIS and appendices. This effort resulted in many of these regional stakeholders providing input and comments, and even drafting work products or portions of these documents. This regional input provided the Corps with an insight and perspective not found in previous processes. A great deal of this information was subsequently included in the FR/EIS and appendices; therefore, not all of the opinions and/or findings herein may reflect the official policy or position of the Corps.



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## ACRONYMS AND ABBREVIATIONS

BPA	Bonneville Power Administration
CAD	computer-aided drafting
Comp Plan	Lower Snake River Fish and Wildlife Compensation Plan
Corps	U.S. Army Corps of Engineers
ESA	Endangered Species Act
Feasibility Study	Lower Snake River Juvenile Salmon Migration Feasibility Study
FR/EIS	Lower Snake River Juvenile Salmon Migration Feasibility Report/ Environmental Impact Statement
GIS	geographic information system
HEP	Habitat Evaluation Procedure
HMU	Habitat Management Unit
HSI	Habitat Suitability Index
HU	habitat unit
IDFG	Idaho Department of Fish and Game
LSRP	Lower Snake River Project
MOA	Memorandum of Agreement
NMFS	National Marine Fisheries Service
NPPC	Northwest Power Planning Council
O&M	Operation and Maintenance
PFA	public fishing area
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WRDA	Water Resources Development Act
XYZ	X, Y, and Z lands

## ENGLISH TO METRIC CONVERSION FACTORS

<u>To Convert From</u>	<u>To</u>	<u>Multiply By</u>
<u>LENGTH CONVERSIONS:</u>		
Inches	Millimeters	25.4
Feet	Meters	0.3048
Miles	Kilometers	1.6093
<u>AREA CONVERSIONS:</u>		
Acres	Hectares	0.4047
Acres	Square meters	4047
Square Miles	Square kilometers	2.590
<u>VOLUME CONVERSIONS:</u>		
Gallons	Cubic meters	0.003785
Cubic yards	Cubic meters	0.7646
Acre-feet	Hectare-meters	0.1234
Acre-feet	Cubic meters	1234
<u>OTHER CONVERSIONS:</u>		
Feet/mile	Meters/kilometer	0.1894
Tons	Kilograms	907.2
Tons/square mile	Kilograms/square kilometer	350.2703
Cubic feet/second	Cubic meters/sec	0.02832
Degrees Fahrenheit	Degrees Celsius	(Deg F -32) x (5/9)

# Executive Summary

The U.S. Army Corps of Engineers (Corps) is conducting a feasibility study of ways to improve juvenile salmon migration through the hydropower system on the lower Snake River. The study focuses on how the lower Snake River dams can be changed to improve survival and recovery prospects for Snake River salmon stocks listed under the Endangered Species Act. Three major pathways are being evaluated for the four lower Snake River dams: maintain the existing system with planned improvements; make major system improvements to bypass facilities; and natural river drawdown.

## ES.1 Mitigation History and Status

### History:

The history and status of mitigation on the lower Snake River and other lands associated with the Lower Snake River Fish and Wildlife Compensation Plan (Comp Plan) must be taken into consideration when evaluating operational changes to the Snake River system. The Comp Plan was a negotiated mitigation settlement to compensate for fish and wildlife habitat lost with associated losses in hunting and fishing opportunities due to the construction of the Lower Snake River Project. Any changes to the existing system may impact the existing mitigation program.

The Comp Plan is divided into four programs: resident fish, anadromous fish, terrestrial wildlife habitat, and hunter and fisherman access. The initial goals of the Comp Plan are contained in: *Special Report: Lower Snake River Fish and Wildlife Compensation Plan-Lower Snake River, Washington and Idaho* (Corps, 1975a). The plan has since been modified to reflect updated goals.

The **anadromous fish mitigation program** was focused on hatchery rearing of fish stocks affected by construction and operation of the Lower Snake River Project. Hatcheries were constructed or modified in Washington, Oregon, and Idaho to produce various fish stocks for release in the Snake and Columbia rivers and tributaries. The U.S. Fish and Wildlife Service (USFWS) oversees the operation of these hatcheries.

The **resident fish mitigation program** was also initially based on a hatchery production program. The program was altered somewhat in 1986 when funding to construct hatchery raceways was given instead to Washington Department of Fish and Wildlife (WDFW) for various stream restoration projects in southeast Washington. Another aspect of this program is the purchase of lands adjacent to the tributaries of the Snake and Columbia Rivers in southeastern Washington and western Idaho to develop public fishing access areas.

The **terrestrial wildlife mitigation program** is divided into three distinct areas.

- **Development of project lands purchased as a part of the Lower Snake River Project.** The lands along the lower Snake River were developed to provide habitat for many game and non-game species, including mule deer, downy woodpecker, yellow warbler, river otter, ring-necked pheasant, California quail, Canada goose, mallard, western meadowlark, chukar partridge, and song sparrow. Fifty-four Habitat Management Units (HMUs) were identified along the Snake River from Ice Harbor Dam to the upper extent of the Lower Granite pool. Of the 54 HMUs (comprising 3,616.4 hectares [8,936 acres]), 22 received some level of

development. Of these 22, 10 HMUs (totaling 1,318.5 hectares [3,258 acres]) were developed and maintained on an intensive level. Approximately 445.2 hectares (1,100 acres) were planted within these intensive HMUs, with 388.5 hectares (960 acres) under irrigation. The sites were developed according to the *Design Memorandum for Wildlife Habitat Development* (Corps, 1975b) and its supplement (Corps, 1979a).

- **Acquisition of new lands and easements to provide public hunting opportunities for ring-necked pheasant and chukar partridge.** This land acquisition program also has gone through changes. In 1986, it was decided it was more cost effective to purchase lands outright rather than set up leases in perpetuity. Since 1987, more than 9,712.8 hectares (24,000 acres) of land have been purchased or leased. Habitat developments and other facilities are currently being constructed on these lands.
- **Game Farm Alternative.** The third area of the wildlife mitigation program is a game farm to provide ring-necked pheasant releases on lower Snake River lands. The game farm alternative began in 1989. The program funded WDFW to obtain easements/leases on private lands to develop ring-necked pheasant habitat, and to open most of these lands to the public for hunting. This program is scheduled to run through the year 2007.

### **Current Status:**

Most of the Comp Plan requirements have been met with regard to the purchase and construction of anadromous and resident fish hatcheries. The final stages of this program are currently being executed to turn these facilities over to the USFWS.

For the terrestrial program, the Habitat Evaluation Procedure (HEP) is being used to measure habitat loss, as well as habitat needed to meet the goals of the Comp Plan for terrestrial wildlife. The initial HEP baseline and onsite analysis was performed in 1989 and 1990. These data were published in *Special Report: Lower Snake River Fish and Wildlife Compensation; Wildlife Habitat Compensation Evaluation for the Lower Snake River Project* (Sather-Blair et al., 1991).

Since 1991, most lands purchased for wildlife habitat and fisher access have been evaluated. The data show that some habitats for listed species meet or exceed the mitigation goals set forth under the Comp Plan. Other habitat areas have not yet met the goals.

In recent years, mitigation has been re-evaluated for the Columbia River hydropower projects. The Northwest Power Planning Council (NPPC) has worked with the Corps and other agencies to consolidate fish and wildlife mitigation associated with the Federal hydropower facilities in the Columbia Basin. This program now includes the lower Snake River mitigation. Future mitigation associated with the lower Snake River will be coordinated through NPPC.

### **Future Mitigation Requirements:**

Little or no change to the present mitigation program will occur under non-dam breaching alternatives of the Lower Snake River Juvenile Salmon Migration Feasibility Study, and the goals and objectives of the existing mitigation program will continue to be implemented as directed by Congress. If dam breaching is the preferred alternative, the area of current mitigation most affected could be the terrestrial wildlife habitat program. The present program could come to an end, and a new program could be drafted. The HEP evaluation of the current conditions will give an estimate of the potential habitat loss due to drawdown after dam breaching. The existing developments could

add some value for interim mitigation until the lower Snake River corridor re-establishes riparian vegetation. The HEP also gives an estimate of vegetation needed in the Snake River corridor to meet mitigation goals. The basic needs include:

- 6,070.5 hectares (15,000 acres) seeded to grass
- 607 hectares (1500 acres) planted with willow cuttings
- 323.7 hectares (800 acres) planted with trees and shrubs associated with riparian forest habitat
- 121 hectares (300 acres) of food plots established and maintained
- Noxious weed control and monitoring on 4,047 hectares (10,000 acres)
- Periodic wildlife and habitat monitoring to track mitigation progress
- Fencing and water developments to protect shoreline areas from livestock
- Pump intake modifications to insure HMUs will have irrigation to maintain HU value.

More details of this work will be presented in a mitigation plan if dam breaching becomes the preferred alternative.

# 1. Introduction

The Lower Snake River Juvenile Salmon Migration Feasibility Study (Feasibility Study) evaluates four alternatives that may help salmon and steelhead passage (upstream and downstream) on the lower Snake River. All of the alternatives except one will keep the dams of the Lower Snake River Project (LSRP) intact. The alternatives, which will not change the current river operation, will not impact existing fish and wildlife resources to a significant extent. This appendix gives the past history and current status of mitigation on the lower Snake River and other lands associated with the Lower Snake River Fish and Wildlife Compensation Plan (Comp Plan) (Corps, 1975a). This appendix will touch on the entire Comp Plan program; however, it focuses on the means with which the current anadromous fishery and terrestrial wildlife habitat mitigation were quantified and how past mitigation will be applied in the future.



## **2. History of Mitigation Activities Under the Lower Snake River Fish and Wildlife Compensation Plan**

### **2.1 Initial Mitigation Goals**

#### **2.1.1 Introduction**

The foundation of the present mitigation for the region came from the Comp Plan. This plan was written to fulfill the U.S. Army Corps of Engineers (Corps) obligation to the Fish and Wildlife Coordination Act (1958). The plan was authorized under the Water Resources Development Act (WRDA) of 1976. Anadromous fish, resident fish, and terrestrial wildlife mitigation for the region were covered in this report. Since most of the impacts were in the State of Washington, most of the mitigation which was not for anadromous fish, was formulated by the Corps, U.S. Fish and Wildlife Service (USFWS), and Washington Department of Fish and Wildlife (WDFW). The anadromous fish mitigation was developed through a multi-agency regional effort. Federal, State, and other regional interests were all involved with the coordination for the anadromous and resident fisheries mitigation under the Comp Plan.

The scope of the mitigation was based primarily on the species and habitat impacted by the construction of the Lower Snake River Project. The anadromous fish scope centers on the lower Snake River and its major tributaries. The Irrigon Hatchery, though outside of this region, provides steelhead stocks that are released in tributaries to the Snake River above the confluence of the Clearwater River. The listing of the hatcheries is shown in Table 2-1, and the map of their locations is shown in Annex D.

The terrestrial mitigation scope centers on the lower Snake River. Additional lands were purchased in the region because the Corps' lower Snake River lands could not provide the habitat needed to fully compensate for the habitat loss due to the construction of the Lower Snake River Project. The lands along the lower Snake River are shown in Annex B. The listing of additional lands is shown in Table 2-2.

The resident fish mitigation scope centers on the lower Snake River. Lyon's Ferry is the only hatchery devoted to rainbow trout production. Fish releases are targeted to isolated ponds along the lower Snake River, though other ponds in the region are also stocked.

The Game Farming option and later the Game Farm Alternative were actions added to compensate for the interim terrestrial habitat loss while new lands are developed to provide the targeted habitat value. This program first focused on the lower Snake River, but later it expanded to lands in southeast Washington.

#### **2.1.2 Anadromous Fish**

To compensate for the loss of fall chinook spawning and migration through dams, a hatchery capable of accommodating 2,290 adult females and like number of males producing 11.5 million eggs and 9.1 million juveniles at release time was needed. This level of fall chinook production was projected to bring back an estimated 18,300 adults to the river system. This would take the

**Table 2-1.** Lower Snake River Fish and Wildlife Compensation Plan Fish Hatchery Facilities

Hatchery	O&M Agency	Fish Type	Production Goals in Pounds	Satellite Facility
Looking Glass	ODFW	Spring chinook	69,600	Big Canyon Creek Imnaha Looking Glass Wallowa
Irrigon	ODFW	Steelhead	279,600	Big Canyon Creek Wallowa Little Sheep Creek Looking Glass
Lyons Ferry	WDFW	Fall chinook	101,800	Curl Lake (Acclimation)
		Spring chinook	8,800	Tucannon River
		Steelhead	116,400	Cottonwood (Acclimation)
		Trout	45,000	Dayton Pond (Acclimation) Capt. John (Acclimation) Pittsburgh Landing (Acclimation) Big Canyon, Idaho (Acclimation)
Sawtooth	IDFG	Spring chinook	149,000	E. Fork Salmon River Sawtooth
Dworshak	USFWS	Spring chinook	70,000	Dworshak
Clearwater	IDFG	Steelhead	350,000	Crooked River
		Spring chinook	91,300	Powell Red River
Magic Valley	IDFG	Steelhead	291,500	Sawtooth E. Fork Salmon River
Hagerman	USFWS	Steelhead	340,000	Sawtooth E. Fork Salmon River
McCall	IDFG	Summer chinook	61,300	McCall

production of 101,800 pounds of young fall chinook salmon, which will be released to the river system.

To compensate for spring and summer chinook losses, a hatchery capable of accommodating 2,140 adult females and a like number of males producing 9.6 million eggs and 6.75 million juveniles at release time was needed. This level of summer chinook production was projected to bring back an estimated 58,700 adults above the project area. This would take the production of 450,000 pounds of young spring and summer chinook salmon, which will be released to the river system.

To compensate for steelhead trout losses, a hatchery capable of accommodating 3,390 adult females and a like number of males producing 17 million eggs and 11 million juveniles at release time was needed. This level of steelhead production was projected to bring back an estimated 55,100 adults

**Table 2-2. XYZ Lands Acquired as Lower Snake River Fish and Wildlife Compensation Plan**

State	Names Management	County	Site Managed by	Total Area In Acres		Idaho Sites Z	Washington Sites by Credit Element Class			Acres for WA	WDFW Acres	Corps Acres
				fee title	easement		X	Y	Z			
ID	Ahsahka PFA	Nez Perce	IDFG	9.0		9.0				0.0	0.0	0.0
WA	Asotin Cr. Easements	Asotin	WDFW		12.5				12.5	0.0	0.0	0.0
WA	Bailie Ranch	Franklin	WDFW		3,897.0		3,897.0			3,897.0	3,897.0	0.0
WA	Benton City PFA	Benton	WDFW	16.1					16.1	16.1	16.1	0.0
WA	Burma Road PFA	Okanogan	WDFW	4.2					4.2	4.2	4.2	0.0
WA	Campbell U. of Asotin Cr. WA	Asotin	WDFW	529.3				532.8	4.6	532.8	532.8	0.0
<b>WA</b>	<b>Central Ferry HMU</b>	<b>Whitman</b>	<b>Corps</b>	<b>288.2</b>			<b>164.8</b>	<b>123.4</b>		<b>288.2</b>	0.0	<b>288.0</b>
WA	Couse Cr. PFA	Asotin	WDFW	3.0					3.0	3.0	3.0	0.0
WA	Donald Rd. PFA	Yakima	WDFW	75.3					75.3	75.3	75.3	0.0
WA	Eight mi. Touchet R. PFA	Walla Walla	WDFW		2.4				2.4	0.0	0.0	0.0
WA	Ferry Road PFA	Yakima	WDFW	117.0					117.0	117.0	117.0	0.0
WA	Fisher Gulch U. of Joseph Cr. WA	Asotin	WDFW	1,647.0				1,690.1		1,690.1	1,690.1	0.0
WA	Hartsock U. (695 Addition)	Columbia	WDFW	8.0				6.7		6.7	0.0	0.0
WA	Hartsock U. of Wooten WA	Columbia	WDFW	2,348.4			133.5	2,308.5	7.0	2,442.0	2,442.0	0.0
<b>WA</b>	<b>John Henley HMU</b>	<b>Whitman</b>	<b>Corps</b>	<b>718.0</b>			<b>162.0</b>	<b>556.0</b>		<b>756.0</b>	0.0	<b>756.0</b>
<b>WA</b>	<b>Kelly Bar HMU</b>	<b>Garfield</b>	<b>Corps</b>	<b>268.0</b>				<b>268.0</b>		<b>253.6</b>	0.0	<b>253.6</b>
ID	Magill PFA	Nez Perce	IDFG	14.0		14.0				0.0	0.0	0.0
WA	McDonald Br. PFA	Walla Walla	WDFW	22.6					21.0	21.0	21.0	0.0
WA	McDonald Br. PFA	Walla Walla	WDFW	99.4					97.3	97.3	97.3	0.0
<b>WA</b>	<b>Mill Creek HMU (FWWTR)</b>	<b>Walla Walla</b>	<b>Corps</b>	<b>63.0</b>			<b>63.0</b>			<b>63.0</b>	<b>0.0</b>	<b>63.0</b>
ID	Myrtle Beach PFA	Nez Perce	IDFG	11.0		11.0				0.0	0.0	0.0
WA	Naches Rd. PFA	Yakima	WDFW	7.1					7.5	7.5	7.5	0.0
<b>WA</b>	<b>Nisqually John Canyon HMU <sup>1</sup></b>	<b>Whitman</b>	<b>Corps</b>	<b>3,077.8</b>				<b>3,059.7</b>		<b>3,059.7</b>	0.0	<b>3,059.7</b>
WA	Pentler Cr.	Asotin	WDFW	4,261.0				4,361.0		4,361.0	4,361.0	0.0
WA	Revere Ranch	Whitman	WDFW	2,291.0			2,264.0		27.0	2,291.0	2,291.0	0.0
WA	Schumaker U. of Joseph Cr. WA	Asotin	WDFW	2,033.0				2,080.8	8.1	2,080.8	2,080.8	0.0
WA	Sulphur Cr. PFA	Yakima	WDFW	88.0					89.3	89.3	89.3	0.0
WA	Swank PFA	Asotin	WDFW	51.4					51.4	51.4	51.4	0.0
WA	Swegle Rd. PFA (phase I)	Walla Walla	WDFW	37.4	35.3				78.0	37.4	37.4	0.0
WA	Swegle Rd. PFA (phase II)	Walla Walla	WDFW	46.8					46.8	46.8	46.8	0.0
<b>WA</b>	<b>Wallula HMU (part of)</b>	<b>Walla Walla</b>	<b>Corps</b>	<b>182.0</b>			<b>190.0</b>		<b>14.6</b>	<b>190.0</b>	0.0	<b>190.0</b>
WA	Whitstrand PFA	Benton	WDFW	21.6					22.6	22.6	22.6	0.0
WA	Windmill Ranch	Franklin	WDFW	1,533.7				1,533.7		1,533.7	1,533.7	0.0
<b>TOTALS</b>				<b>19,872.3</b>	<b>3,947.2</b>	<b>34.0</b>	<b>8,408.0</b>	<b>14,987.0</b>	<b>705.7</b>	<b>24,034.5</b>	<b>19,417.3</b>	<b>4,610.3</b>

Some acres are double credited. The property was purchased as an element X or element Y property; however, the land also provided acres that were creditable as fisherman access lands, so element Z credit was also assigned. Acres will not add up due to adjustments by subsequent surveys.

LS = Letter Supplement, PFA = Public Fishing Area, HMU = Habitat Management Unit (on-project land to be managed by COE all others by state wildlife agencies),

X = California Quail and Pheasant Hunting Land, Y = Chukar Hunting Land, Z = Fisherman Access Land, U. = Unit, R. = River, Cr. = Creek, WA = both state of Wash. and Wildlife Area,

L2-3

above the project area. This would take the production of 1,377,500 pounds of young steelhead, which will be released to the river system.

Existing hatcheries in the region were expanded where possible to accommodate the increased production. New hatcheries were also constructed in areas where facilities did not exist. To compensate for lost angler use-days, angler access sites were purchased in Washington and Idaho.

### **2.1.3 Resident Fish**

Resident fisheries losses and reduced angler use-days would be compensated by a hatchery capable of producing 93,000 pounds of rainbow trout per year. These fish would be used to stock ponds in the vicinity of the Snake River for put and take fisheries.

### **2.1.4 Terrestrial Wildlife Habitat**

#### **2.1.4.1 Introduction**

Terrestrial wildlife mitigation has been implemented in Washington and Idaho as a result of the construction of the LSRP. Mitigation has been accomplished by the purchase and development of lands adjacent to the Snake River and other selected parcels in southeastern Washington. The lands have been developed and maintained at varying intensity levels. Lands managed by the Corps have been labeled Habitat Management Units (HMUs). State managed lands have other titles like Habitat Management Areas, etc. Some lands only have fencing and a few wildlife structures such as water catchments (water troughs which are filled by rainwater) and brush piles. Other lands have been developed with irrigation (intensive management). The acreage planted under irrigation in all HMUs include food plots, meadows, pastures, and shrub and tree plots. A full listing of these sites and developments is shown in Annex B: Tabulation of Facilities of Lower Snake River Comp Plan Lands.

### **Wildlife Mitigation in Idaho**

The Idaho Department of Fish and Game (IDFG) also determined that mitigation would be needed for terrestrial habitat losses due to the inundation of lands by Lower Granite Reservoir. It was determined that 46.1 hectares (114 acres) of wildlife habitat was lost in the State of Idaho due to the riparian inundation by Lower Granite Dam impoundment. A 1982 memorandum of agreement (MOA), stated that the mitigation for this lost terrestrial wildlife habitat would be compensated for within the Hells Gate HMU. The Corps agreed to leave 337.1 hectares (833 acres) of natural area in Hells Gate Park as a wildlife HMU. Of the 337.1 hectares (833 acres), approximately 46.1 hectares (114 acres) would be developed and would be maintained as an intensive wildlife HMU.

### **Wildlife Mitigation in Washington-Snake River Lands**

The first goal of the terrestrial wildlife mitigation program in Washington was to protect all existing habitat along the lower Snake River. This was accomplished by fencing livestock out of the habitat areas and providing cattle watering corridors and easements for the adjacent land owners.

A second goal was to provide upland game habitat and to stock these areas with ring-necked pheasants until the habitat matured to a stage where pheasants would be supported naturally.

The third goal was to provide nesting, brooding, and loafing habitat for Canada geese. This was accomplished by erecting and maintaining nesting platforms and planting and mowing grass pastures. This work was performed primarily in the intensive HMUs.

The fourth goal was to provide a variety of habitats for deer, furbearers, and non-game birds all along the Snake River. This was accomplished by planting grass meadows, shrubs, and trees on intensive HMUs and on shoreline areas within non-irrigated HMUs. A bird box program was also started. The purpose of the bird box program was to compensate for the loss of nesting cavities in mature riparian forests. Boxes were built, installed, maintained, and monitored as a part of this program.

The final goal was to obtain additional lands to fully compensate for upland game habitat losses. Compensation could not be met on the existing Project lands, so additional lands and developments were required.

Starting around 1977, habitat development and maintenance was initiated on the lower Snake River as mitigation in the State of Washington for construction of the LSRP. When the Comp Plan was drafted in the mid-1970s, terrestrial wildlife management techniques and principles were applied to meet State of Washington hunting opportunity needs and to provide habitat for non-game animals. To do this, there had to be a determination of how many acres were lost in the State of Washington due to inundation by the lower four reservoirs on the Snake River. Project lands available when the Comp Plan was drafted totaled approximately 10,117.5 hectares (25,000 acres). Recreational developments were already constructed, and others were planned for non-developed parcels. The undeveloped lands along the lower Snake River were then designated for wildlife management purposes. Of these undeveloped lands, 54 HMUs were identified along the Snake River from Ice Harbor Dam to the upper extent of the Lower Granite pool. Of the 54 HMUs that comprised 3,616.4 hectares (8,936 acres), 22 received some level of development. Of these 22, ten HMUs, totaling 1,318.5 hectares (3,258 acres), were developed and maintained on an intensive level. Approximately 445.2 hectares (1,100 acres) were planted within these intensive HMUs, with 388.5 hectares (960 acres) under irrigation. The sites were developed according to the Design Memorandum for Wildlife Habitat Development (Corps, 1975b) and Supplement (Corps, 1979a).

### **Wildlife and Angler Mitigation in Washington and Idaho-XYZ Lands**

The term X, Y, and Z (XYZ) lands was used initially in Design Memoranda 2A and 6 (Corps, 1979b and c). Element X lands are those lands purchased in the State of Washington in fee or easement to compensate for riparian vegetation and farmland for ring-necked pheasant and hunter use-day losses. Element Y lands are those lands purchased in the State of Washington in fee or easement to compensate for chukar partridge and hunter use-day losses. Element Z lands are those lands purchased in the States of Washington and Idaho in fee or easement to compensate for angler access losses.

Element X required the purchase of 161.9 hectares (400 acres) of riparian habitat and 3,237.6 hectares (8,000 acres) of surrounding farmland in easement. These lands would provide cover and food for pheasants and access for public hunting. Some minor developments such as sanitation facilities, fencing, parking lots, brush piles, water catchments, dryland grass, and woody vegetation plantings would be constructed on portions of the properties acquired.

Element Y required the purchase of easements for 6,070.5 hectares (15,000 acres) of chukar habitat in the Snake River breaks to provide access for public hunting. Some minor developments such as sanitation facilities, fencing, brush piles, water catchments, and parking lots would be constructed on portions of the properties acquired.

Element Z required the purchase of 283.3 hectares (700 acres) in Washington and 20.2 hectares (50 acres) in Idaho, in small parcels, to provide angler access. Some minor developments such as sanitation facilities, fencing, and parking lots would be constructed on portions of the properties acquired. See Table 2-3 for a list of XYZ land requirements for Washington and Idaho.

**Table 2-3. XYZ Land Requirements for Washington and Idaho**

<b>Element</b>	<b>Size</b>
X (pheasant)	8,400 acres
Y (chukar)	15,000 acres
Z (angler access)	750 acres
<b>Total lands</b>	<b>24,150 acres</b>

Note: Element X and Element Y include land requirements for Washington. Element Z includes land requirements for Washington and Idaho.

### **Wildlife Mitigation in Washington-Game Farm**

As a part of the initial mitigation, a game farm would be needed to raise and stock pheasants for the first 20 years of the compensation period. Pheasants numbering 20,000 would be planted on lands in southeastern Washington each year. The intensive HMUs were designed to provide upland game habitat. Roosts, water catchments, and brush piles were erected to provide cover and water until plantings matured. Initially, only about 3,500 pheasants were released on Corps lands. This release was expected to increase, as more Comp Plan lands became available.

## **2.2 Modifications and Present Status of Mitigation**

### **2.2.1 Anadromous Fish**

Several memorandums were written detailing the mitigation progress for anadromous fisheries (Corps, 1980, 1981, 1983b, and 1996). Table 2-2 lists the hatcheries and their respective functions in meeting the requirements for fish production under the Comp Plan. Some of these facilities were added after the initial agreement. These new facilities include Looking Glass (water treatment plant); Pittsburgh Landing, Big Canyon, and Captain John rapids acclimation facilities; and adult capture, acclimation and release facilities for Catherine Creek or the upper Grande Ronde River.

The Corps designed and constructed modifications at existing hatcheries and built new hatchery facilities to provide space to produce the fish required under the Comp Plan. The majority of the Operation and Maintenance (O&M) at these facilities is conducted by USFWS and IDFG.

The Eagle Fish Health Lab near Boise was constructed by the Corps to combine support facilities for the individual hatcheries in Idaho. This facility was turned over to the USFWS, who will be responsible for all operations and maintenance of the fish facilities after construction is complete.

At this time, most hatcheries and acclimation facilities have been transferred to the USFWS. Some facilities are still pending, due to last minute modifications that were requested prior to the transfer.

## 2.2.2 Resident Fish

The resident fish program was also changed from the initial goals. The WDFW requested that the cost of hatchery space necessary to produce 48,000 pounds of rainbow trout could be better spent in a restoration program for selected streams in southeastern Washington (Corps, 1981). These funds have been applied to 4,876.6 meters (16,000 feet) of in-stream projects. Project work included 55 log weirs, 24 rock weirs, 4 trash barriers, and 1,469 boulder placements. Stream work was performed in the Tucannon River and Asotin Creek. The work was completed in 1986.

## 2.2.3 Terrestrial Wildlife Habitat

### 2.2.3.1 Wildlife Mitigation in Idaho

Hells Gate HMU was designed to have a variety of developments, on 46.1 hectares (114 acres), much like the other intensive HMUs in Washington. These developments included shrub and tree plantings, fields and food plots, brush piles, water catchments, bird boxes, perches, a parking lot, and fencing. The shrubs and trees would be developed with and without irrigation. Other plantings would be developed without irrigation. The remaining acreage would remain relatively undeveloped.

No specific mitigation requirements were established for Hells Gate HMU. As long as the area is managed for the wildlife values as stated in *Design Memorandum for Wildlife Habitat Development: Supplement No. 2-Hells Gate Habitat Unit* (Corps, 1987), mitigation requirements would be met.

As of today, many of the requirements have been met. The irrigation system is operating and shrub and tree plantings have been completed; dryland grass seedings have been performed; and many of the structures have been erected. A listing of current plantings and structures at Hells Gate is contained in Annex B: Tabulation of Facilities of Lower Snake River Comp Plan Lands. The Corps is currently working with the State of Idaho to complete the mitigation as planned.

### 2.2.3.2 Wildlife Mitigation in Washington-Lower Snake River Lands

Currently, 59 HMUs (including XYZ lands) are identified along the lower Snake River in Washington. Ten of these HMUs are being managed at an intensive level (See Annex B). Some changes have occurred due to a land swap. Wilma HMU, which was identified as an intensive HMU in the original mitigation (Corps, 1975a and 1979a), was converted to a dredge disposal site and turned over to the Port of Wilma. To compensate for this loss of habitat, additional lands were purchased adjacent to Rice Bar and Willow Bar HMUs. Irrigated developments at these new lands next to Rice Bar HMU, will compensate for the loss of habitat at Wilma. Another irrigated development is planned on one of the HMUs in Little Goose pool, but a site has not been finalized. The number of intensive HMUs will grow to 12 with these new developments.

### 2.2.3.3 Wildlife and Angler Mitigation in Washington and Idaho-XYZ Lands

A special report to congress (Corps, 1983b) made it evident that finding land owners willing to provide easements of the kind stated in the original Comp Plan (Corps, 1975a) to meet desired goals would be difficult if not impossible. It was most cost-effective to purchase tracks of lands in fee or perpetual easement that had characteristics of the three elements. The WRDA of 1986 allowed all XYZ lands to be purchased in fee or perpetual easement. O&M costs of off-project lands would be

the responsibility of the WDFW, and on-project lands (purchased adjacent to existing Corps property near the lower Snake River) would be the responsibility of the Corps.

As of today, all of the XYZ land parcels have been purchased in the State of Washington. Only a few acquisitions were easements. The Bailie Ranch is the largest easement property. Developments have begun on most of the XYZ lands and should be complete in 2001. WDFW has already given written concurrence for the XYZ land acreage goals. In Idaho, lands were purchased following the guidelines in Corps, 1983a. As of 1996, 13.8 of 20.2 hectares (34 of 50 acres) of element Z lands had been purchased. Table 2-2 lists the land acquisitions that satisfy the requirements of elements X, Y, and Z under the Comp Plan. Annex D contains maps that show the location of all Comp Plan lands and facilities.

#### **2.2.3.4 Wildlife Mitigation in Washington-Game Farm Alternative**

It was decided in the WRDA of 1986 to alter the original game farm program in Washington State (Corps, 1986). The main reason for this change was that the programs were not producing the desired results. The State of Washington was also moving away from game farming. This part of the Comp Plan was viewed as a separate entity to address interim mitigation until the habitat developments matured. Through a new letter of agreement, between the Corps and the State of Washington, the Corps would fund the WDFW to implement an alternative to game farming. The funds, which would have been used to raise and release pheasants, would be used to purchase land easements and fund vegetative developments or crop set-asides. The purpose of this work was to increase off-project pheasant habitat while also providing additional lands for hunter access. The landowners would open their lands to hunting on a voluntary basis. Most of the landowners in the program have done this. This program is administered by WDFW. The program is scheduled to end in 2007.

### **2.3 Bonneville Power Administration Mitigation**

Starting in 1992, the Bonneville Power Administration (BPA), through the Northwest Power Planning Council, started drafting an agreement that would make them responsible for all fish and wildlife mitigation in the Columbia River Basin. The scope of this responsibility would also include the lower Snake River. The document was finalized late in 1994 (NWPPC, 1994). After the Corps finishes land purchases and developments along the Snake River and adjacent areas, BPA would assume the funding responsibility for the remaining mitigation. As of 1998, all lands have been purchased and developments are still ongoing. A letter dated January 9, 1997, from the Corps to BPA stated that mitigation status for the Comp Plan would be established by 2002.

BPA has received a preliminary estimate of lower Snake River mitigation shortfalls. The Nez Perce tribe has stated that additional mitigation will be needed beyond those numbers presented by the State of Washington. BPA has already purchased 4,047.0 hectares (10,000 acres) adjacent to the Joseph Creek Wildlife Area in Oregon, near the Grande Ronde River. There has also been a proposal to BPA for the purchase of an additional 1,618.8 hectares (4,000 acres) adjacent to this parcel. No mitigation value has yet been placed on these lands. It is not currently known whether any credit from these land purchases will be applied to the Lower Snake River Comp Plan mitigation requirements.



## 2.4 Fish Barging Program

Fish barging is not a mitigation effort addressed under the Comp Plan. Barging of juvenile anadromous fish began in 1977. The Corps was funding National Marine Fisheries Service (NMFS) research on the use of trucks to transport juvenile anadromous fish. Due to low water flows resulting from drought conditions, NMFS, along with the state fisheries agencies, asked the Corps if barges could be used to transport fish. In 1977, 234,000 fish collected at Lower Granite Dam and 2,000,000 fish from hatcheries were transported and released below Bonneville Dam. The various fish agencies felt the transport program was a success so they requested that the Corps continue the program.

In 1978, the Corps expended about \$500,000 to convert two army barges for fish transport. The program continued to grow as more Comp Plan hatcheries were completed and additional juvenile fish releases performed. Two more barges were built in 1980-81, and the barging program expanded to include collection at Little Goose, Lower Monumental and McNary dams. When certain salmon and steelhead races were listed under Endangered Species Act (ESA), NMFS required the Corps to barge more fish. Two more barges were added to the fleet in 1998. Trucks are used to transport fish when collection numbers are too low to warrant the use of the barges. The program currently costs approximately 2.5 million dollars a year to operate. The program is discussed in the 1995 Biological Opinion by NMFS (NMFS, 1995).

## 3. Measuring Mitigation Status

### 3.1 Introduction

There are several programs under the Comp Plan that are being monitored for mitigation status. These programs include anadromous and resident fish, terrestrial wildlife mitigation, and the game farm alternative. Anadromous fish status is currently based on hatchery production of selected fish stocks. The USFWS, in the Coordination Act Report (Appendix M), stated that anadromous fish mitigation is not to be measured by production of juveniles. The production numbers were estimates for meeting adult fish returns to their respective spawning grounds. There has been no methodology proposed on how to track adult returns that will provide data on which to base anadromous fish mitigation goals. The resident fisheries program is still being based on hatchery production, which is being provided at Lyon's Ferry hatchery. The game farm alternative has been set with a specific deadline, so no other measures are needed. The terrestrial wildlife mitigation has changed the methodology used to monitor mitigation progress. Initially, mitigation status for wildlife was based on animal counts. In the late 1980s, this methodology changed to the HEP. All lands used for terrestrial wildlife mitigation have been analyzed using HEP. This process will be discussed in more detail in the following sections, with estimates of the current status of this program.

### 3.2 Habitat Evaluation Procedure Analysis

#### 3.2.1 Introduction

Only one published and accepted HEP is currently being applied to the Comp Plan. This HEP was presented in: "Special Report: Lower Snake River Fish and Wildlife Compensation; Wildlife Habitat Compensation: Evaluation for the Lower Snake River Project" (Sather-Blair, et. al., 1991). This is the original HEP performed on the lower Snake River to determine the amount of compensation still needed for the Comp Plan. This document will be referred to as the 1991 report.

Additional HEP data has been collected for the XYZ lands. As XYZ land parcels were purchased or leased, preliminary HEP analyses were performed on these lands to quantify development goals. These initial analyses were started while data were being collected for the 1991 report but were not published.

HEP data was collected again for the XYZ lands (USFWS, 1995) to validate previously collected data. XYZ lands that were not analyzed by the previous data collection efforts were analyzed informally by Corps personnel.

#### 3.2.2 How Habitat Evaluation Procedure Measures Habitat Quality and Quantity

HEP is a process that measures habitat of a specific wildlife species to determine a measure of quality. The measure of quality is termed the Habitat Suitability Index (HSI). The HSI is multiplied by the area of habitat used by a particular wildlife species to determine the number of habitat units (HUs). The HEP process is usually performed by a team that represents the various interested parties. The team is usually made up of biologists, but may also include any individuals who have an interest in the land in question.

The process starts with the land area to be analyzed. A wildlife species list is developed for the land area. The species list is based on the habitat available on the land parcel in question. After the list is developed, existing HEP models for these species are reviewed. If the existing models are adequate for measuring habitat on the land in question, then no further changes are necessary. If the model is not adequate, then the model is either modified or not used. If the model is not used, another species model may be used.

The species models are a set of habitat parameters that provide the optimum habitat for the species. Some parameters are based on vegetation cover percentages and heights. Others include distance to water or some structure in the landscape. The model also describes the vegetative and physical landscape that provides habitat for the species. These landscape features are termed cover types. Many species are found using similar cover types. The habitat parameters that benefit one species in a cover type may not benefit another species using the same area.

Cover types are delineated for the land area in question. These delineations are usually made with aerial photographs. Areas for each cover type in question are measured from this mapping effort.

Field variables are measured in each cover type that a species may use in the study area. These field variables are used in a mathematical equation to determine the HSI value of a cover type for the species in question. Each cover type will have a separate HSI for each species utilizing it. HUs are determined for each species by multiplying the HSI value by the area of the cover type. Some species rely on several cover types in conjunction with one another. They are referred to as multiple cover type species. If the study area is large or data collected after the fact, HSI values may be averaged from sampling points collected throughout the study area.

### **3.2.3 Habitat Evaluation Procedure Analysis for Comp Plan Terrestrial Wildlife Mitigation**

#### **3.2.3.1 Introduction**

The HEP analyses presented here were a combination of those used in the 1991 report and other data sources. Most HSI values were obtained from the 1991 report and USFWS, 1995. A few XYZ land parcels have HSI values derived from undocumented sources. Cover type areas were derived from the 1991 report, USFWS, 1997, and XYZ mapping efforts performed by the Corps, WDFW, and USFWS. Since the data being presented here come from different time frames and sources, they can only be considered an estimate of terrestrial wildlife mitigation status. Table 3-1 lists which cover types are used by the wildlife species in this analysis.

#### **3.2.3.2 Habitat Units for 1991 Report**

The HEP analysis in the 1991 report was performed in two parts; upper river and lower river. The HEP analysis was performed using the mapped cover type acreages that were entered into a geographic information system (GIS) on the computer. The cover type data, from 1958 and 1987 aerial photography, were digitized into the computer using a computer-aided drafting (CAD) program tied to a GIS database. Cover-type acres were calculated for each specific habitat type shown in Table 3-1. These acreages were multiplied by the HSI variables for each species in the evaluation. Separate HSI values were used to determine the pre-project and current condition HUs. The current condition was subtracted from the pre-project HUs to determine the current HU debt or surplus under the Comp Plan. The results of the 1991 report are presented in Table 3-2.

**Table 3-1.** Evaluation Species and Cover Types Used

Species	Riparian Forest	Palustrine Scrub-Shrub	Palustrine Emergent	Shore	Open Water	Mesic Shrubland	Annual Forbs/Grass	Steppe Low	Steppe High	Grass	Rock	Agricultural Crop	Pasture
Mule Deer	X	X				X	X	X	X	X			
California Quail		X	X				X	X	X	X	X		X
Ring-necked Pheasant	X	X	X			X	X	X	X			X	X
Chukar Partridge						X		X	X	X	X		
Downy Woodpecker	X												
Yellow Warbler		X											
Marsh Wren			X										
Western Meadowlark							X	X	X	X			
Song Sparrow	X					X							
Canada Goose				X									
Mallard					X								
River Otter				X									

### 3.2.3.3 Habitat Units for the Lower Snake River Cover Type Update

The habitat mapping performed for the 1991 report was reevaluated in 1995 to 1996 by the USFWS. This effort involved updating habitat acreages from 1987 aerial photography (used in the 1991 report) to 1995 aerial photography (USFWS, 1997). This work had several objectives when updating habitat acreages. One objective was to reflect changes from 1987 to 1995 due to vegetative growth or loss. Another objective was to cleanup mapping boundaries where gross errors were evident. A third objective was to correct errors in cover type labels.

The updated covertype mapping was digitized into the computer GIS database. The same HSI variables used in the 1991 report were applied to the 1995 cover typing to determine the estimated HEP on the lower Snake River. The HU results of this covertype update are shown in Tables 3-3.

### 3.2.3.4 Habitat Units for the XYZ Lands

For the XYZ lands, covertypes, from 1991 to 1995 aerial photography, were transferred to the computer using a CAD program. The CAD data were not feature coded for inclusion into the GIS database. Habitat acres were derived from these CAD maps. Cover type acres were multiplied by the HSI values to determine the overall HU value for the site. Summaries of HEP results for these lands are shown in Table 3-4. Five element Z land parcels were not analyzed using the HEP process because they were easements or not in Washington. These lands were Ahsahka Public Fishing Access (Idaho), Myrtle Beach (Idaho), Asotin Creek easements (WA), Eight Mile, Touchet River easement (WA), and Magill PFA (Idaho).

### 3.2.4 Habitat Evaluation Procedure Credits

HEP crediting was discussed in the 1991 report. All lands on the lower Snake River were given full HEP values. XYZ lands were given only 50 percent of the existing HU value for each species (Annex C). If the XYZ lands were developed for additional HEP credit, then the developed acres were given full HEP credit. Bailie Ranch, which is under a State (WDFW) lease, receives no HEP

**Table 3-2.** Estimated Habitat Evaluation Procedures Data Results from 1991 Report Data

Compensation Element Covertypes or Species Group (and evaluation species)	Estimated Habitat for the Lower Snake River Before the Construction of the Lower Snake River Project 1958			Estimated Habitat for the Lower Snake River Before the Construction of the Lower Snake River Project 1958			Estimated Habitat for the Lower Snake River After the Construction of the Lower Snake River Project 1987			Estimated Habitat for the Lower Snake River After the Construction of the Lower Snake River Project 1987			Estimated Habitat Lost on the Lower Snake River After the Construction of the Lower Snake River Project 1991 Report Habitat Units Needed for Compensation		
	Below Little Goose Dam			Above Little Goose Dam			Below Little Goose Dam			Above Little Goose Dam			Acres Habitat 1958	Acres Habitat 1987	Habitat Units Needed
	Acres Habitat	Habitat Suitability Index	Habitat Units	Acres Habitat	Habitat Suitability Index	Habitat Units	Acres Habitat	Habitat Suitability Index	Habitat Units	Acres Habitat	Habitat Suitability Index	Habitat Units			
<b>Riparian Forest</b>															
(downy woodpecker)	202.2	1	<b>202.2</b>	508.6	1	<b>508.6</b>	49.6	0.03	<b>1.5</b>	79.6	0.59	<b>47.0</b>	710.8	129.2	<b>662.3</b>
<b>Riparian Forest Understory</b>															
(song sparrow)	202.2	1	<b>202.2</b>	508.6	0.95	<b>483.2</b>	49.6	1	<b>49.6</b>	79.6	0.96	<b>76.4</b>	710.8	129.2	<b>559.4</b>
<b>Scrub-Shrub Wetland</b>															
(yellow warbler)	804.2	0.81	<b>651.4</b>	932.4	0.55	<b>512.8</b>	126.2	0.77	<b>97.2</b>	155	0.64	<b>99.2</b>	1736.6	281.2	<b>967.8</b>
<b>Emergent Wetland</b>															
(marsh wren)	4.1	0.27	<b>1.1</b>	5.9	0	<b>0.0</b>	49.7	0.27	<b>13.4</b>	4.3	0	<b>0.0</b>	10.0	54.0	<b>(12.3)</b>
<b>Mesic Shrubland</b>															
(song sparrow)	42.1	0.83	<b>34.9</b>	795.2	1	<b>795.2</b>	140.9	0.71	<b>100.0</b>	454.7	1	<b>454.7</b>	837.3	595.6	<b>275.4</b>
<b>Shrub-Steppe Grassland</b>															
(western meadowlark)	11784.5	0.34	<b>4,006.7</b>	11064.1	0.35	<b>3,872.4</b>	7534.1	0.32	<b>2,410.9</b>	7080.7	0.52	<b>3,682.0</b>	22848.6	14614.8	<b>1786.3</b>
<b>Furbearer</b>															
(river otter)	4377.3	0.45	<b>1,969.8</b>	5021.4	0.24	<b>1,205.1</b>	3738.1	0.45	<b>1,682.1</b>	4828.8	0.46	<b>2,221.2</b>	9398.7	8566.9	<b>(728.5)</b>
<b>Big Game</b>															
(mule deer)	12833	0.29	<b>3,721.6</b>	13300.3	0.34	<b>4,522.1</b>	7850.8	0.36	<b>2,826.3</b>	7769.9	0.34	<b>2,641.8</b>	26133.3	15620.7	<b>2775.6</b>
<b>Upland Game Bird</b>															
(California quail)	14311.8	1	<b>14,311.8</b>	14439.7	0.95	<b>13,717.7</b>	7909.2	0.16	<b>1,265.5</b>	7927.7	0.35	<b>2,774.7</b>	28751.5	15836.9	<b>23989.3</b>
<b>Upland Game Bird</b>															
(ring-necked pheasant)	7964.5	0.39	<b>3,106.2</b>	9563.4	0.46	<b>4,399.2</b>	4689.2	0.29	<b>1,359.9</b>	2412.3	0.63	<b>1,519.7</b>	17527.9	7101.5	<b>4625.7</b>
<b>Upland Game Bird</b>															
(chukar)	138.7	0	<b>0.0</b>	12399.75	0.8	<b>9,919.8</b>	8460	0.01	<b>84.6</b>	8309.5	0.79	<b>6,564.5</b>	12538.5	16769.5	<b>3270.7</b>
<b>Waterfowl</b>															
(mallard)	138.7	0.28	<b>38.8</b>	155	0.33	<b>51.2</b>	308.3	0.21	<b>64.7</b>	196.4	0.27	<b>53.0</b>	293.7	504.7	<b>(27.8)</b>
<b>Waterfowl</b>															
(Canada goose)	5621.7	0.35	<b>1,967.6</b>	6562	0.29	<b>1,903.0</b>	4982.5	0.21	<b>1,046.3</b>	6369.4	0.12	<b>764.3</b>	12183.7	11351.9	<b>2059.9</b>

Note: From "Lower Snake River Fish and Wildlife Compensation Plan, Wildlife Habitat Compensation Evaluation for the Lower Snake River Project, June 1991," (91 Report) using 1958 and 1987 photography.

**Table 3-3. Adjustments to Habitat Evaluation Procedures Data Results from 1991 Report**

Compensation Element Covertypes or Species Group (and evaluation species)	Estimated Habitat for the Lower Snake River Before the Construction of the Lower Snake River Project 1958			Estimated Habitat for the Lower Snake River Before the Construction of the Lower Snake River Project 1958			Estimated Habitat for the Lower Snake River After the Construction of the Lower Snake River Project 1995			Estimated Habitat for the Lower Snake River After the Construction of the Lower Snake River Project 1995			Estimated Habitat Deficit on the Lower Snake River After the Construction of the Lower Snake River Project 1995 (without XYZ Lands) Habitat Units Needed for Compensation		
	Below Little Goose Dam			Above Little Goose Dam			Below Little Goose Dam			Above Little Goose Dam					
	Acres	Habitat	Habitat	Acres	Habitat	Habitat	Acres	Habitat	Habitat	Acres	Habitat	Habitat	Acres	Acres	Habitat
	Habitat	Suitability	Units	Habitat	Suitability	Units	Habitat	Suitability	Units	Habitat	Suitability	Units	Habitat	Habitat	Units
		Index			Index			Index			Index		1958	1987	Needed
<b>Riparian Forest</b>															
(downy woodpecker)	202.2	1	<b>202.2</b>	508.6	1	<b>508.6</b>	295.1	0.03	<b>8.9</b>	164.0	0.59	<b>96.8</b>	710.8	459.1	<b>605.2</b>
<b>Riparian Forest Understory</b>															
(song sparrow)	202.2	1	<b>202.2</b>	508.6	0.95	<b>483.2</b>	295.1	1	<b>295.1</b>	164.0	0.96	<b>157.4</b>	710.8	459.1	<b>232.8</b>
<b>Scrub-Shrub Wetland</b>															
(yellow warbler)	804.2	0.81	<b>651.4</b>	932.4	0.55	<b>512.8</b>	301.4	0.77	<b>232.1</b>	290.9	0.64	<b>186.2</b>	1736.6	592.3	<b>746.0</b>
<b>Emergent Wetland</b>															
(marsh wren)	4.1	0.27	<b>1.1</b>	5.9	0	<b>0.0</b>	250	0.27	<b>67.5</b>	103.2	0	<b>0.0</b>	10	353.2	<b>(66.4)</b>
<b>Mesic Shrubland</b>															
(song sparrow)	42.1	0.83	<b>34.9</b>	795.2	1	<b>795.2</b>	170.1	0.71	<b>120.8</b>	582.0	1	<b>582.0</b>	837.3	752.1	<b>127.4</b>
<b>Shrub-Steppe Grassland</b>															
(western meadowlark)	11784.5	0.34	<b>4,006.7</b>	11064.1	0.35	<b>3,872.4</b>	7282.7	0.32	<b>2,330.5</b>	8105.9	0.52	<b>4,215.1</b>	22848.6	15388.6	<b>1,333.6</b>
<b>Furbearer</b>															
(river otter)	4377.3	0.45	<b>1,969.8</b>	5021.4	0.24	<b>1,205.1</b>	3738.1	0.45	<b>1,682.1</b>	4828.7	0.46	<b>2,221.2</b>	9398.7	8566.8	<b>(728.4)</b>
<b>Big Game</b>															
(mule deer)	12833	0.29	<b>3,721.6</b>	13300.3	0.34	<b>4,522.1</b>	8049.3	0.36	<b>2,897.7</b>	9142.8	0.34	<b>3,108.6</b>	26133.3	17192.1	<b>2,237.4</b>
<b>Upland Game Bird</b>															
(California quail)	14311.8	1	<b>14,311.8</b>	14439.7	0.95	<b>13,717.7</b>	8097.6	0.16	<b>1,295.6</b>	9212.4	0.35	<b>3,224.3</b>	28751.5	17310.0	<b>23,509.6</b>
<b>Upland Game Bird</b>															
(ring-necked pheasant)	7964.5	0.39	<b>3,106.2</b>	9563.4	0.46	<b>4,399.2</b>	5388.1	0.29	<b>1,562.5</b>	3057.9	0.63	<b>1,926.5</b>	17527.9	8446.0	<b>4,016.3</b>
<b>Upland Game Bird</b>															
(chukar)	138.7	0	<b>0.0</b>	12399.75	0.8	<b>9,919.8</b>	8361.3	0.01	<b>83.6</b>	9582.4	0.79	<b>7,570.1</b>	12538.45	17943.7	<b>2,266.1</b>
<b>Waterfowl</b>															
(mallard)	138.7	0.28	<b>38.8</b>	155	0.33	<b>51.2</b>	372.3	0.21	<b>78.2</b>	237.1	0.27	<b>64.0</b>	293.7	609.4	<b>(52.2)</b>
<b>Waterfowl</b>															
(Canada goose)	5621.7	0.35	<b>1,967.6</b>	6562	0.29	<b>1,903.0</b>	4982.5	0.21	<b>1,046.3</b>	6369.4	0.12	<b>764.3</b>	12183.7	11351.9	<b>2,059.9</b>

Note: Data from "Lower Snake River Fish and Wildlife Compensation Plan, Wildlife Habitat Compensation Evaluation for the Lower Snake River Project, June 1991," (91 Report) and 1995 HEP Validation by US Fish and Wildlife Service using 1958 and 1995 photography.

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**Table 3-4. Estimated XYZ Habitat Credit**

Compensation Element Covertypes or Species Group (and evaluation species)	XYZ Lands Adjacent to Corps Managed Lands on the Lower Snake River in 1995 Below Little Goose Dam		XYZ Lands Adjacent to Corps Managed Lands on the Lower Snake River in 1995 Above Little Goose Dam		XYZ Lands NOT Adjacent to Corps Managed Lands on the Lower Snake River in 1995 Southeastern Washington		XYZ Lands Adjacent to Corps Managed Lands on the Lower Snake River in 1995 Total Both Halves		Totals for XYZ Lands Purchased and Developed for Lower Snake River Compensation 1995	
	Acres	Habitat	Acres	Habitat	Acres	Habitat	Acres	Habitat	Acres	Habitat
	Habitat	Units	Habitat	Units	Habitat	Units	Habitat	Units	Habitat	Units
<b>Riparian Forest</b> (downy woodpecker)	8.9	0.0	204.9	41.6	489.4	152.7	213.8	41.6	703.2	194.2
<b>Riparian Forest Understory</b> (song sparrow)	8.9	0.0	204.9	42.6	473.7	174.5	213.8	42.6	687.5	217.1
<b>Scrub-Shrub Wetland</b> (yellow warbler)	0	0.0	0	0.0	99.9	36.1	0	0.0	99.9	36.1
<b>Emergent Wetland</b> (marsh wren)	0	0.0	0	0.0	127.2	9.9	0	0.0	127.2	9.9
<b>Mesic Shrubland</b> (song sparrow)	31.7	25.8	315	54.9	1010.5	341.5	346.7	80.7	1357.2	422.2
<b>Shrub-Steppe Grassland</b> (western meadowlark)	1127.9	42.6	6038.5	530.1	16788.2	2,092.3	7166.4	572.7	23954.6	2,665.0
<b>Furbearer</b> (river otter)	0	0.0	5.2	0.0	547.5	137.7	5.2	0.0	552.7	137.7
<b>Big Game</b> (mule deer)	1168.5	83.2	6563.6	558.1	17944.4	2,125.8	7732.1	641.3	25676.5	2,767.1
<b>Upland Game Bird</b> (California quail)	1181	48.1	6566.6	1,039.4	18640.3	1,433.0	7747.6	1,087.4	26387.9	2,520.4
<b>Upland Game Bird</b> (ring-necked pheasant)	595	0.0	3163	0.0	7048.7	720.5	3758	0.0	10806.7	720.5
<b>Upland Game Bird</b> (chukar)	1204.7	0.0	6442.2	1,119.7	11686.7	3,597.7	7646.9	1,119.7	19333.6	4,717.4
<b>Waterfowl</b> (mallard)	0	0.0	0	0.0	122.1	8.0	0	0.0	122.1	8.0
<b>Waterfowl</b> (Canada goose)	0	0.0	0	0.0	58.3	21.0	0	0.0	58.3	21.0

Note: Data from "Lower Snake River Fish and Wildlife Compensation Plan, Wildlife Habitat Compensation Evaluation for the Lower Snake River Project, June 1991," (91 Report) and 1995 HEP Validation by US Fish and Wildlife Service using 1958 and 1995 photography.

credit for existing habitat value. This is because WDFW has no control over the land management practices being employed. If the State is able to institute developments that improve the habitat value of the land, then these acres will be given full HEP credit. An estimate of total HEP credits and debits (as of 1995) from all Comp Plan Lands is given in Table 3-5.

**Table 3-5.** Estimated Habitat Evaluation Procedures Data Results for Terrestrial Wildlife Habitat Compensation Under the Lower Snake River Fish and Wildlife Compensation Plan

Compensation Element Covertypes or Species Group (and evaluation species)	No. of HUs Existing Pre- Projects 1958	No. of HUs on Lower Snake River Project Lands 1995	Est. No. of HUs Provided provided by XYZ Lands in 1995	Total HUs for all Lands Purchased and Developed for Compensation in 1995	Compensation Balances in Estimated HUs Provided in 1995 by all Washington Lands that Can Produce Credit for the four Lower Snake River Projects	
					Compensation Exceeds Losses	Uncompensated Losses
<b>Riparian Forest</b>						
(downy woodpecker)	710.8	107.0	194.2	301.2		409.6
<b>Riparian Forest Understory</b>						
(song sparrow)	685.4	453.2	217.1	670.3		15.1
<b>Scrub-Shrub Wetland</b>						
(yellow warbler)	1,164.2	418.2	36.1	454.3		709.9
<b>Emergent Wetland</b>						
(marsh wren)	1.1	68.5	9.9	78.4	77.3	
<b>Mesic Shrubland</b>						
(song sparrow)	830.1	703.1	422.2	1,125.4	295.3	
<b>Shrub-Steppe Grassland</b>						
(western meadowlark)	7,879.1	6,523.7	2,665.0	9,188.7	1,309.6	
<b>Furbearer</b>						
(river otter)	3,174.9	3,903.3	137.7	4,041.0	866.1	
<b>Big Game</b>						
(mule deer)	8,243.7	6,010.7	2,767.1	8,777.8	534.1	
<b>Upland Game Bird</b>						
(California quail)	28,029.5	4,523.3	2,520.4	7,043.7		20,985.8
<b>Upland Game Bird</b>						
(ring-necked pheasant)	7,505.4	3,462.1	720.5	4,182.6		3,322.8
<b>Upland Game Bird</b>						
(chukar)	9,919.8	7,634.5	4,717.4	12,351.9	2,432.1	
<b>Waterfowl</b>						
(mallard)	89.9	141.9	8.0	149.9	60.0	
<b>Waterfowl</b>						
(Canada goose)	3,870.6	1,810.7	21.0	1,831.7		2,038.9

Note: HU = habitat units



## **4. Future of Compensation Plan**

### **4.1 Introduction**

This appendix has two purposes. The first is to provide a starting point for discussion of existing mitigation conditions in the event there is a change from the current operation implemented from the Feasibility Study. The second is to describe the present status of the Comp Plan in the event there is no change to the present Snake River operation (alternatives other than dam breaching).

### **4.2 Non-Drawdown Alternatives**

#### **4.2.1 Anadromous Fish**

The portion of the Comp Plan designated for anadromous fish losses is in the final stages. At this time most of the hatcheries and other facilities have been turned over to the USFWS. The hatchery and facility operation will still be funded through congressional appropriations. The Corps will still have to coordinate with the various hatcheries that provide fish during the fish transport season. Fish passage and transport improvements will still continue at each of the four dams. This work is currently funded by BPA. Fish transport costs will still be funded by the Corps. The Corps fish passage and transport program will continue to be coordinated with NMFS and WDFW.

#### **4.2.2 Resident Fish**

The resident fish program will continue as it has in the past. The stream restoration portion has been completed. Rainbow trout will still be reared in Lyon's Ferry Hatchery and released in local ponds. The Corps will not be involved, except at the operational projects that manage the ponds where fish are released. Coordination between WDFW and the Corps is necessary to insure management for the resident fisheries program can continue with the support it currently receives from each of the projects.

#### **4.2.3 Terrestrial Wildlife Mitigation**

If there is not a change from the present operation of the LSRP, the present Comp Plan will still be valid. Work is being initiated to start a final HEP evaluation to determine the HU status of the terrestrial wildlife portion of the Comp Plan. After a comprehensive HEP evaluation is completed, the terrestrial wildlife portion of the Comp Plan is planned to be turned over to BPA. It is not clear what will be recommended by the USFWS and WDFW after the HEP analysis is performed.

#### **4.2.4 Lower Snake River Lands-Corps Managed**

Once the final HEP is completed, BPA will be funding most of the continued operations and maintenance of these lands directly. The Corps is presently managing these lands and will continue to do so unless another managing agency chooses to assume this responsibility. Current funding is based on land proportions designated for wildlife mitigation. BPA is funding about 70 percent of wildlife mitigation at Ice Harbor Dam. This percentage goes up to about 95 percent at Lower Granite dam. The Corps funds the difference.

#### **4.2.5 XYZ Lands-WDFW Managed**

These lands are currently under WDFW management, with funding for O&M coming from the State of Washington. Once the final HEP evaluation is completed, WDFW will manage these lands to maintain their HU value. There are some concerns about whether the state can continue to fund these areas for administration and management. Since WDFW is overseeing the entire terrestrial wildlife mitigation for the State of Washington, a new funding agreement with the Corps or BPA may be necessary to cover the costs of administration and possibly some O&M.

#### **4.2.6 Game Farm Alternative**

The game farm alternative has been progressing steadily since the program began in 1989. Many lands in southeast Washington have had habitat developments made. The program will end in 2007. Work has started to convert some of these easements into the Conservation Reserve Program and others like it.

#### **4.2.7 Future Monitoring and Land Crediting**

BPA is directing the funding of Federal fish and wildlife mitigation projects in the Columbia Basin . As discussed previously, BPA has agreed to take over funding responsibility for the remaining fish and wildlife mitigation under the Comp Plan. BPA has also made a land purchase that is supposed to add credit to the lower Snake River mitigation. Mitigation lands will need to be maintained at current levels to insure mitigation values are protected. Additional land purchases and developments may be funded in the future. The Corps may or may not be involved with these lands and developments. Another Federal or state agency may manage the current lands under mitigation in the future. The Corps and/or BPA will still be responsible for tracking and monitoring mitigation to insure the program moves toward the final goals. WDFW will also need support to continue its involvement in the monitoring program. Any changes to the existing development schemes need to be reviewed by USFWS and WDFW. IDFG is the reviewing agency in the State of Idaho.

### **4.3 Drawdown Alternative**

#### **4.3.1 Anadromous Fish**

The current fish bypass and transport program at the four dams would come to an end with the drawdown of the lower Snake River. Drawdown would create conditions that would speed fish migration through the lower Snake River. It is still not known whether transport would continue from McNary Dam. Many factors would be weighed to determine the future fish management at the Columbia River Projects.

#### **4.3.2 Resident Fish**

The resident fish program would suffer setbacks with the loss of Dalton Lake, Fishhook ponds, and other backwater stocking areas along the lower Snake River. Resident fisheries would not have a chance to rebound until the river stabilizes after drawdown. There may be the need for short-term measures (pond development) to compensate for the loss of the put-and-take trout fisheries.

#### **4.3.3 Terrestrial Wildlife Mitigation**

Table 4-1 shows the estimated HUs, by species, that would be left along the lower Snake River after drawdown. The numbers were derived by eliminating the acres of habitat associated with the

subirrigation zone along the existing river level. These plant communities included palustrine forest, palustrine forest understory, palustrine emergent, and palustrine scrub-shrub.

Mesic shrubland would be impacted most on the lower river since the majority of the side canyons are devoid of this vegetative type. The upper river has many side canyons that have intermittent or permanent water sources. To represent the drawdown condition in Table 4-1, an arbitrary value of zero was applied to the lower river areas for mesic shrubland. Upriver areas had mesic shrubland acres reduced by 50 percent. The final values are only valid if the existing intensive HMUs and Comp Plan lands are developed and maintained according to present goals under the Comp Plan.

To obtain the potential mitigation with drawdown, HUs of lands unaffected by drawdown are subtracted from the 1958 figures generated in the 1991 report. There would still be an HU short-fall, even if intensive HMUs are irrigated after drawdown and the XYZ lands are managed as they are today. The vegetative communities, which would be the focus of the lower Snake River drawdown restoration, are palustrine forest, mesic shrubland, and palustrine scrub-shrub.

The Idaho terrestrial mitigation should also be mentioned at this time. In Corps, 1987, initial HU goals were set for the Hells Gate HMU development. Since the focus of this mitigation was for upland species, Hells Gate HMU would still provide this mitigation credit, under a drawdown scenario, if the irrigation system is maintained and prescribed developments are carried out.

If the drawdown alternative is implemented, the following restoration and management would be recommended:

- 6,070.5 hectares (15,000 acres) seeded to grass
- 607 hectares (1500 acres) planted with willow cuttings
- 323 hectares (800 acres) planted with trees and shrubs associated with riparian forest habitat
- 121 hectares (300 acres) of food plots established and maintained
- Noxious weed control and monitoring on 4,047 hectares (10,000 acres)
- Periodic wildlife and habitat monitoring to track mitigation progress
- Fencing and water developments to protect shoreline areas from livestock
- Pump intake modifications to insure HMUs will have irrigation to maintain HU value.

#### **4.3.4 Existing XYZ Lands and Public Fishing Access**

There will be many questions about credits provided already from off-project wildlife habitat developments and public fishing access sites. All existing mitigation land values will be needed initially to compensate for habitat losses due to drawdown. XYZ lands are just now going through the final stages of facilities construction/habitat development, more than 20 years after the Comp Plan was published. It would take at least another 25 years for the lower Snake River corridor to exhibit good riparian vegetation values after drawdown occurs. The existing HMUs, HMA's, and PFA's would still be needed for compensation until riparian vegetation can become established and mature.

**Table 4-1. Potential Mitigation Goals if Lower Snake River is Drawn Down**

Compensation Element Covertype or Species Group (and evaluation species)	Mitigation Goal if Lower Snake River is Drawn Down Lower Snake River Project 1958 HEP Figures Both Halves		Habitat Along the Lower Snake River which can be Maintained by Irrigated HMUs 1995 Both Halves		Upland Habitat Along the Lower Snake River which would be Unaffected by Drawdown 1995 Both Halves		Estimated Habitat Loss Along the Lower Snake River Due to Drawdown 1995 Total Both Halves		Estimated Habitat Loss Along the Lower Snake River if LSR HMUs are Irr. 1995 Total Both Halves		Interim Mitigation Deficit if Lower Snake River HMUs are Irr. and XYZ Lands not Adjacent to LSR are Maintained Est. 1995 Figures*
	Acres Habitat	Habitat Units	Acres Habitat	Habitat Units	Acres Habitat	Habitat Units	Acres Habitat	Habitat Units	Acres Habitat	Habitat Units	Habitat Units
<b>Riparian Forest</b>											
(downy woodpecker)	710.8	<b>710.8</b>	391.7	<b>57.1</b>	0.0	<b>0.0</b>	664.0	<b>147.2</b>	272.3	<b>90.1</b>	<b>501.0</b>
<b>Riparian Forest Understory</b>											
(song sparrow)	710.8	<b>685.4</b>	391.7	<b>228.8</b>	0.0	<b>0.0</b>	664.0	<b>495.1</b>	272.3	<b>266.3</b>	<b>282.1</b>
<b>Scrub-Shrub Wetland</b>											
(yellow warbler)	1736.6	<b>1,164.2</b>	156.9	<b>111.3</b>	0.0	<b>0.0</b>	592.3	<b>418.3</b>	435.4	<b>306.9</b>	<b>1,016.7</b>
<b>Emergent Wetland</b>											
(marsh wren)	10	<b>1.1</b>	184.7	<b>48.0</b>	0.0	<b>0.0</b>	353.2	<b>67.5</b>	168.5	<b>19.5</b>	<b>-56.8</b>
<b>Mesic Shrubland</b>											
(song sparrow)	837.3	<b>830.1</b>	512.3	<b>215.2</b>	260.0	<b>260.0</b>	838.8	<b>523.5</b>	326.5	<b>308.3</b>	<b>13.4</b>
<b>Shrub-Steppe Grassland</b>											
(western meadowlark)	22848.6	<b>7,879.2</b>	9370.3	<b>1,568.9</b>	13184.7	<b>5,527.5</b>	0.0	<b>0.0</b>	0.0	<b>0.0</b>	<b>-1,309.5</b>
<b>Furbearer</b>											
(river otter)	9398.7	<b>3,174.9</b>	1582.4	<b>717.5</b>	6989.5	<b>69.9</b>	1582.4	<b>3,833.4</b>	6924.3	<b>3,115.9</b>	<b>2,249.9</b>
<b>Big Game</b>											
(mule deer)	26133.3	<b>8,243.7</b>	10445.3	<b>1,587.8</b>	13444.7	<b>4,703.5</b>	11479.5	<b>1,944.1</b>	1034.2	<b>356.2</b>	<b>-173.5</b>
<b>Upland Game Bird</b>											
(California quail)	28751.5	<b>28,029.5</b>	10552.2	<b>1,855.5</b>	13471.3	<b>3,469.3</b>	11586.3	<b>2,138.1</b>	1034.1	<b>282.6</b>	<b>21,271.7</b>
<b>Upland Game Bird</b>											
(ring-necked pheasant)	17527.9	<b>7,505.3</b>	2316.5	<b>1,000.5</b>	4926.9	<b>1,869.0</b>	3519.1	<b>1,620.0</b>	1202.6	<b>619.5</b>	<b>3,915.3</b>
<b>Upland Game Bird</b>											
(chukar)	12538.45	<b>9,919.8</b>	8462.8	<b>2,142.1</b>	15596.6	<b>6,403.2</b>	8789.3	<b>2,370.3</b>	326.5	<b>228.2</b>	<b>-2,223.1</b>
<b>Waterfowl</b>											
(mallard)	293.7	<b>90.0</b>	104.6	<b>24.4</b>	240.4	<b>54.7</b>	369.0	<b>87.5</b>	264.4	<b>63.2</b>	<b>3.0</b>
<b>Waterfowl</b>											
(Canada goose)	12183.7	<b>3,870.6</b>	2091.6	<b>347.3</b>	9260.3	<b>1,463.3</b>	2091.6	<b>347.3</b>	0.0	<b>0.0</b>	<b>2,038.9</b>

\*Acre values not shown since this figure is misleading. Mitigation goals are based on habitats that will have a higher HSI value than was used for this analysis. The actual acres would equal those used in 1958 if their habitat value is maximized. Data from 1995 HEP Validation by US Fish and Wildlife Service, Corps Cover Mapping and Data Collection using 1991-1995 photography. HSI Values not shown since they are different from site to site (See Annex A for values)

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#### **4.3.5 Game Farm Alternative**

The game farm alternative was implemented in 1989. By the time lower Snake River drawdown could actually occur, this program will be finished. The premise of the program was to increase pheasant numbers and hunter opportunities in eastern Washington for 20 years while other habitat developments were completed and vegetation matured. With delays in purchasing lands and their subsequent development, the game farm alternative has built a large network of farms in eastern Washington that provide pheasant habitat and hunter opportunities. This portion of the Comp Plan has fulfilled its purpose so no credits should be generated from this source for future mitigation.

#### **4.3.6 Bonneville Power Administration Mitigation**

Currently, the BPA is funding Federal fish and wildlife mitigation projects in the Columbia Basin due to hydropower projects. BPA may not support further mitigation on the lower Snake River after drawdown because the power generation from the lower four Snake River dams would come to an end with drawdown. BPA's role will be better defined in future meetings on this subject.

## 5. Literature Cited

- National Marine Fisheries Service. 1995. "Biological Opinion, Reinitiating of Consultation on 1994-1998 Operation of the Federal Columbia River Power System and Juvenile Transportation Program in 1995 and Future Years," NOAA, National Marine Fisheries Service. Seattle, WA.
- Northwest Power Planning Council. 1994. "Columbia River Basin Fish and Wildlife Program," Northwest Power Planning Council, Portland, Oregon, 220 pgs.
- Sather-Blair, Christensen, and Ross. 1991. "Special Report: Lower Snake River Fish and Wildlife Compensation; Wildlife Habitat Compensation Evaluation for the Lower Snake River Project," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 59 pgs plus Appendices.
- U.S. Army Corps of Engineers. 1997. Letter to Bonneville Power Administration, January 9, 1997, U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 2 pgs.
- U.S. Army Corps of Engineers. 1996. "Supplement to Special Report: Lower Snake River Fish and Wildlife Compensation Plan-Lower Snake River, Washington and Idaho, June 1975," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 30 pgs.
- U.S. Army Corps of Engineers. 1987. "Design Memorandum for Wildlife Habitat Development: Supplement No. 2-Hells Gate Habitat Unit Lower Snake River Project," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 24 pgs.
- U.S. Army Corps of Engineers. 1986. "Design Memorandum 20: Game Farm Alternative: Habitat Development," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 20 pgs.
- U.S. Army Corps of Engineers. 1983a. "Design Memorandum 8: Idaho Fishing Access Site Selection," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 15 pgs.
- U.S. Army Corps of Engineers. 1983b. "Special Report: Lower Snake River Fish and Wildlife Compensation Plan," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 95 pgs.
- U.S. Army Corps of Engineers. 1981. "Letter Supplement #1: Instream Habitat Improvement," under Design Memorandum 4: Lyon's Ferry, Washington Hatchery Revision #1, U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 4 pgs.
- U.S. Army Corps of Engineers. 1980. Design Memorandum 4: Lyon's Ferry, Washington Hatchery Revision #1, U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 94 pgs.
- U.S. Army Corps of Engineers. 1979a. "Design Memorandum for Wildlife Habitat Development: Supplement No. 1, Lower Snake River Project," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 148 pgs.

- U.S. Army Corps of Engineers. 1979b. "Design Memorandum 2A: Wildlife Compensation and Fishing Access," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 10 pgs.
- U.S. Army Corps of Engineers. 1979c. "Design Memorandum 6: Wildlife Compensation and Fishing Access Selection," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 36 pgs.
- U.S. Army Corps of Engineers. 1975a. "Special Report: Lower Snake River Fish and Wildlife Compensation Plan-Lower Snake River, Washington and Idaho," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 95 pgs.
- U.S. Army Corps of Engineers. 1975b. "Design Memorandum for Wildlife Habitat Development: Lower Snake River Project," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 125 pgs.
- U.S. Fish and Wildlife Service. 1997. "Lower Snake River Habitat Coverage Analysis," Upper Columbia River Basin Field Office, U.S. Fish and Wildlife Service, Spokane, WA, 3 pgs plus photo mylars.
- U.S. Fish and Wildlife Service. 1995. "Final Report for the HSI Validation Study for the Lower Snake River Fish and Wildlife Compensation Plan," Upper Columbia River Basin Field Office, U.S. Fish and Wildlife Service, Spokane, WA, 10 pgs plus Appendices.

## 6. Glossary

**Anadromous Fish:** Fish species that are born in fresh water but migrate to the ocean to spend a portion of their adult life before returning to fresh water to spawn.

**Annual Grass Forbland:** Herbaceous vegetative type dominated by forbs.

**Boulder Placements:** Placing large boulders in the stream channel to slow the energy of a stream course and create diversity in channel velocity.

**Bunchgrass:** Grass species that grow in a clump. Most native grasses of the shrubsteppe are either bunchgrasses.

**Fall Chinook:** King salmon that enter freshwater from the ocean in early fall. They spawn in the main-stem rivers (larger rivers) during late fall and winter.

**Forb:** Herbaceous vegetation that is not a grass.

**Game Farm Alternative:** Alternative management action to raising and releasing game birds.

**Geomorphological:** Land forms of the terrestrial environment and their associated water bodies.

**Habitat:** Landscape vegetative, geomorphological, and structural elements that an animal species would use during its life cycle.

**Habitat Management Units (HMUs):** Corps term used for lands that have their management focus directed toward development, enhancement, and maintenance of wildlife habitat.

**Hunter Use-Days:** Days that one hunter is using a particular area.

**In-stream:** Occurring in the stream channel.

**Intensive Management:** Management that requires man-made developments and operation and maintenance of these developments.

**Mesic Shrubland:** Shrubby vegetative growth associated with springs and subirrigated dry canyons.

**Mitigation:** Compensation for damages.

**Palustrine Emergent:** Herbaceous vegetative type dominated by tules (cattails and bulrushes, etc.). This vegetative type is associated with wetlands (areas exhibiting certain characteristics as a result of wet soil conditions over a long period of time during the growing season).

**Palustrine Open Water:** Open water area in a lake. Little or no exposed land or vegetation is found protruding through the water surface.

**Palustrine Scrub-Shrub:** Willow thicket associated with a stream or waterbody.

**Perpetual Easement:** A land lease that is continually renewed. Ownership does not change hands.

**Purchase of Lands in Fee:** Purchase of the land outright. Ownership changes.



**Put-and-Take Fisheries:** Fishery where selected ponds and streams are stocked with hatchery-raised fish stocks that are fished by the public. Usually, most of the released fish are caught within the first year after release.

**Resident Fish:** Fish that remain in freshwater streams and lakes for their entire life cycle.

**Riparian:** Associated with a riverine ecosystem.

**Riparian Forest:** Forest vegetative community associated with a stream or waterbody.

**Rock Outcrop/Exposed Rock:** Exposed land areas dominated by exposed rock or riprap. Exposed rock is usually an outcrop of the parent rock that has no soil covering it.

**SHOR:** Area within 75 meters (250 feet) and 100 meters (330 feet) from the shore of a waterbody. This measure is used to calculate habitat values for mallards (duck) and river otters.

**Shrubsteppe:** vegetative type associated with dry benchlands in the intermountain west. Primary plant species are sagebrush and bunchgrasses.

**Spring Chinook:** King salmon that enter freshwater from the ocean in early spring. They breed in the smaller tributaries during the summer and fall months.

**Steelhead:** Anadromous species of rainbow trout.

**Summer Chinook:** King salmon that enter freshwater from the ocean in early summer. They also spawn in the smaller tributaries in late summer and fall.

**Undocumented:** Work performed that had no formal written description. No information on when, where, who, what, and how information was derived.

**Water Resource Development Act (WRDA):** Congressional act that sets funding levels for approved water resource related projects. The act is identified by the year congressional approval is given (WRDA 1975 or WRDA 1986). A wide variety of water resource projects is included in any one approval package. Projects range from stream restoration to mitigation. The Corps obtains funding on various projects through this act.

**Weir:** A low dam-like structure that reduces water energy and creates slack water behind it.

**Willow Cuttings:** Sections of live willow shoots that are cut from existing plants and can be planted into moist soil to grow new willows.

**Annex A**  
**Additional HEP Tables for X, Y, and Z Lands**

**Table A-1.** Preliminary HEP Results for Bailie Ranch (Site: 655)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.00	0.50	0.0	0.0	34.2	34.2
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.00	0.90	0.0	0.0	61.6	61.6
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.50	0.0	0.0	3.2	3.2
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.41	0.0	0.0	25.0	25.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.00	SI per Covertypes	0.0	0.0	831.8	831.8
<b>Mule Deer</b> <i>Big Game</i>	0.00	SI per Covertypes	0.0	0.0	714.5	714.5
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.00	SI per Covertypes	0.0	0.0	672.3	672.3
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.00	SI per Covertypes	0.0	0.0	1189.0	1189.0
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.45	0.0	0.0	34.2	34.2
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.30	0.0	0.0	4.3	4.3

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

I-A-1

**Table A-2.** Preliminary HEP Results for Benton City pfa (Site: 780)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.90	0.90	3.8	1.9	0.0	1.9
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.90	0.90	0.8	0.4	0.0	0.4
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.90	3.8	1.9	0.0	1.9
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.43	0.43	4.0	2.0	0.0	2.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.73	SI per Covertypes	7.7	3.8	0.0	3.8
<b>Mule Deer</b> <i>Big Game</i>	0.45	SI per Covertypes	7.3	3.7	0.3	4.0
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	1.00	SI per Covertypes	16.1	8.1	0.2	8.2
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.55	SI per Covertypes	3.1	1.5	0.0	1.5
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-2

**Table A-3.** Preliminary HEP Results for Burma Rd pfa (Site: 785)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	1.00	0.00	0.5	0.3	0.0	0.3
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	1.00	0.00	0.5	0.3	0.0	0.3
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.25	0.00	1.2	0.6	0.0	0.6
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.34	0.00	0.9	0.4	0.0	0.4
<b>Mule Deer</b> <i>Big Game</i>	0.29	0.00	0.9	0.4	0.0	0.4
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	1.00	0.00	3.1	1.6	0.0	1.6
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.39	0.00	1.2	0.6	0.0	0.6
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Data collected from 1991-1995, Corps, WDFW, Unpublished

L-A-3

**Table A-4.** Preliminary HEP Results Campbell Unit (Site: 705)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.50	0.90	10.1	5.0	8.0	13.1
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.90	0.90	6.6	3.3	0.0	3.3
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.90	18.1	9.0	0.0	9.0
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.56	0.56	12.7	6.3	0.0	6.3
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.34	SI per Covertypes	159.5	79.7	0.0	79.7
<b>Mule Deer</b> <i>Big Game</i>	0.29	SI per Covertypes	142.8	71.4	34.0	105.4
<b>Chukar</b> <i>Upland Gamebird</i>	0.72	SI per Covertypes	364.1	182.1	0.0	182.1
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.42	SI per Covertypes	207.4	103.7	0.0	103.7
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.60	SI per Covertypes	169.9	85.0	0.0	85.0
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-4

**Table A-5. Preliminary HEP Results for Couse Cr. pfa (Site: 730)**

<b>EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION</b>	<b>EXISTING HSI</b>	<b>POST DEVELOPMENT HSI</b>	<b>EXISTING HU's</b>	<b>CREDITED HU's</b>	<b>POST DEVELOPMENT HU's</b>	<b>TOTAL CREDITED HU's</b>
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.10	0.90	0.1	0.0	0.3	0.4
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.90	0.90	0.5	0.2	0.5	0.7
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.90	0.7	0.4	0.0	0.4
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.45	0.45	2.0	1.0	0.0	1.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.34	SI per Covertypes	0.4	0.2	0.0	0.2
<b>Mule Deer</b> <i>Big Game</i>	0.49	SI per Covertypes	1.2	0.6	0.6	1.2
<b>Chukar</b> <i>Upland Gamebird</i>	0.72	SI per Covertypes	1.2	0.6	0.0	0.6
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	1.00	SI per Covertypes	2.4	1.2	0.8	2.0
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.60	SI per Covertypes	0.8	0.4	0.3	0.7
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-5

**Table A-6.** Preliminary HEP Results for Donald Rd pfa (Site: 740)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.90	0.90	28.1	14.0	0.0	14.0
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.90	0.90	7.6	3.8	0.0	3.8
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.90	28.1	14.0	0.0	14.0
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.90	0.90	5.8	2.9	0.0	2.9
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.33	0.18	0.2	0.1	0.0	0.1
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.77	0.77	36.0	18.0	0.0	18.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.26	SI per Covertypes	4.8	2.4	0.0	2.4
<b>Mule Deer</b> <i>Big Game</i>	0.50	SI per Covertypes	32.2	16.1	0.0	16.1
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	1.00	SI per Covertypes	64.4	32.2	0.0	32.2
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.55	SI per Covertypes	30.1	15.1	4.1	19.1
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.54	0.54	1.0	0.5	0.0	0.5
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-6



**Table A-7.** Preliminary HEP Results for Ferry Rd pfa (Site: 750)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.20	0.90	0.2	0.1	0.6	0.6
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.90	0.7	0.4	0.0	0.4
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.26	0.26	1.9	1.0	0.0	1.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.08	SI per Covertypes	3.4	1.7	6.8	8.5
<b>Mule Deer</b> <i>Big Game</i>	0.05	SI per Covertypes	2.3	1.1	7.7	8.8
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.03	SI per Covertypes	1.2	0.6	0.0	0.6
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.01	SI per Covertypes	0.5	0.2	0.0	0.2
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.30	0.0	0.0	5.1	5.1

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-7

**Table A-8.** Preliminary HEP Results for Fisher Gulch Unit (Site: 700)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.50	0.90	7.2	3.6	5.7	9.3
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.90	0.90	87.1	43.6	0.0	43.6
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.90	12.9	6.4	0.0	6.4
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.26	0.26	2.9	1.5	0.0	1.5
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.34	SI per Covertypes	502.5	251.3	0.0	251.3
<b>Mule Deer</b> <i>Big Game</i>	0.25	SI per Covertypes	389.9	195.0	50.0	245.0
<b>Chukar</b> <i>Upland Gamebird</i>	0.72	SI per Covertypes	1206.6	603.3	0.0	603.3
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.12	SI per Covertypes	188.9	94.4	0.0	94.4
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.60	SI per Covertypes	66.7	33.3	0.0	33.3
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-8

**Table A-9.** Preliminary HEP Results for Hartsock Unit (Site: 695)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.90	0.90	91.3	45.6	6.6	52.2
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.50	0.90	110.3	55.2	94.8	150.0
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.90	91.3	45.6	6.6	52.2
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.68	0.68	24.4	12.2	0.0	12.2
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.16	SI per Covertypes	332.6	166.3	17.2	183.5
<b>Mule Deer</b> <i>Big Game</i>	0.32	SI per Covertypes	767.9	383.9	18.7	402.7
<b>Chukar</b> <i>Upland Gamebird</i>	0.36	SI per Covertypes	831.1	415.5	0.0	415.5
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.20	SI per Covertypes	491.1	245.5	104.0	349.5
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.47	SI per Covertypes	169.1	84.5	44.4	128.9
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.54	0.0	0.0	1.5	1.5
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-9

**Table A-10.** Preliminary HEP Results for McDonald Br pfa (Site: 745, managed with 790)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	1.00	0.00	35.5	17.8	0.0	17.8
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.84	0.00	2.9	1.5	0.0	1.5
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	1.00	0.00	35.5	17.8	0.0	17.8
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.81	0.00	9.6	4.8	0.0	4.8
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.43	0.00	2.3	1.2	0.0	1.2
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.34	0.00	8.7	4.4	0.0	4.4
<b>Mule Deer</b> <i>Big Game</i>	0.35	0.04	26.8	13.4	0.0	13.4
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	1.00	0.06	116.3	58.2	0.0	58.2
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.39	0.02	41.5	20.7	0.0	20.7
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Data collected from 1991-1995, Corps,WDFW, Unpublished

L-A-10

**Table A-11.** Preliminary HEP Results for Naches Rd pfa (Site: 775)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.20	0.90	0.5	0.3	1.9	2.2
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.90	2.4	1.2	0.0	1.2
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.85	0.85	1.4	0.7	0.0	0.7
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.45	0.45	3.1	1.5	0.0	1.5
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.34	SI per Covertypes	0.7	0.4	0.0	0.4
<b>Mule Deer</b> <i>Big Game</i>	0.38	SI per Covertypes	2.4	1.2	0.2	1.4
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.64	SI per Covertypes	4.2	2.1	0.0	2.1
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.31	SI per Covertypes	1.4	0.7	0.0	0.7
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-11

**Table A-12.** Preliminary HEP Results for Pintler Cr (Site: 690)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.50	0.90	9.3	4.6	15.4	20.0
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.90	0.90	67.2	33.6	12.9	46.5
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.90	16.7	8.3	8.0	16.3
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.40	SI per Covertypes	1664.7	832.3	0.0	832.3
<b>Mule Deer</b> <i>Big Game</i>	0.27	SI per Covertypes	1118.9	559.5	50.1	609.6
<b>Chukar</b> <i>Upland Gamebird</i>	0.76	SI per Covertypes	3287.1	1643.6	0.0	1643.6
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.03	SI per Covertypes	142.1	71.1	529.7	600.8
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.58	SI per Covertypes	234.5	117.2	21.4	138.7
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-12

**Table A-13.** Preliminary HEP Results for Revere Ranch (Site: 660)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.90	0.90	8.1	4.1	5.4	9.5
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.90	0.90	14.9	7.4	30.2	37.6
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.90	8.1	4.1	5.4	9.5
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.90	0.90	4.5	2.3	6.3	8.6
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.42	0.42	3.8	1.9	0.0	1.9
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.56	0.56	74.4	37.2	0.0	37.2
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.17	SI per Covertypes	352.5	176.3	181.5	357.7
<b>Mule Deer</b> <i>Big Game</i>	0.23	SI per Covertypes	479.2	239.6	53.5	293.1
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.02	SI per Covertypes	46.5	23.3	401.8	425.0
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.17	SI per Covertypes	69.0	34.5	42.5	77.0
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.54	0.54	2.7	1.4	0.0	1.4
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-13

**Table A-14.** Preliminary HEP Results for Schumaker Unit (Site: 685)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.00	0.50	0.0	0.0	9.2	9.2
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.90	0.90	192.5	96.3	0.0	96.3
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.90	16.6	8.3	0.0	8.3
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.55	0.55	21.9	11.0	0.0	11.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.34	SI per Covertypes	579.5	289.7	0.0	289.7
<b>Mule Deer</b> <i>Big Game</i>	0.31	SI per Covertypes	591.9	295.9	0.0	295.9
<b>Chukar</b> <i>Upland Gamebird</i>	0.72	SI per Covertypes	1484.5	742.2	0.0	742.2
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.18	SI per Covertypes	357.5	178.7	0.0	178.7
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.60	SI per Covertypes	139.4	69.7	0.0	69.7
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-14



**Table A-15.** Preliminary HEP Results for Sulphur Cr pfa (Site: 765)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.20	0.90	0.3	0.2	1.2	1.4
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.90	1.5	0.8	0.0	0.8
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.24	0.40	0.1	0.1	0.1	0.1
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.24	0.24	0.9	0.5	0.0	0.5
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.24	SI per Covertypes	20.6	10.3	0.0	10.3
<b>Mule Deer</b> <i>Big Game</i>	0.23	SI per Covertypes	20.3	10.1	0.0	10.1
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.08	SI per Covertypes	6.8	3.4	0.0	3.4
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.10	SI per Covertypes	1.0	0.5	0.0	0.5
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.27	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.30	0.0	0.0	2.8	2.8

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-15

**Table A-16.** Preliminary HEP Results for Swank pfa (Site: 735)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.00	0.20	0.0	0.0	0.6	0.6
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.45	0.45	0.7	0.3	0.0	0.3
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.42	0.42	1.3	0.7	0.0	0.7
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.45	0.45	65.8	32.9	0.0	32.9
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.34	SI per Covertypes	7.2	3.6	0.0	3.6
<b>Mule Deer</b> <i>Big Game</i>	0.09	SI per Covertypes	2.2	1.1	0.0	1.1
<b>Chukar</b> <i>Upland Gamebird</i>	0.90	SI per Covertypes	20.3	10.2	0.0	10.2
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.56	SI per Covertypes	14.5	7.3	0.0	7.3
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.35	SI per Covertypes	1.6	0.8	0.0	0.8
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-16

**Table A-17.** Preliminary HEP Results for Swegle Rd pfa (Site: 755, managed with 760)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	1.00	0.00	41.3	20.7	0.0	20.7
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.83	0.00	1.7	0.9	0.0	0.9
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	1.00	0.00	41.3	20.7	0.0	20.7
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.81	0.00	1.8	0.9	0.0	0.9
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.43	0.00	2.5	1.3	0.0	1.3
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.34	0.00	11.5	5.8	0.0	5.8
<b>Mule Deer</b> <i>Big Game</i>	0.35	0.00	27.8	13.9	0.0	13.9
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	1.00	0.00	79.5	39.8	0.0	39.8
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.39	0.00	18.6	9.3	0.0	9.3
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Data collected from 1991-1995, Corps,WDFW, Unpublished

L-A-17

**Table A-18.** Preliminary HEP Results for Whitstran pfa (Site: 770)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.20	0.90	0.4	0.2	1.4	1.6
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.90	0.90	1.1	0.5	0.0	0.5
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.90	1.8	0.9	0.0	0.9
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.67	0.64	1.2	0.6	0.0	0.6
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.69	0.69	1.0	0.5	0.0	0.5
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.43	0.43	3.4	1.7	0.0	1.7
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.06	SI per Covertypes	0.9	0.5	0.0	0.5
<b>Mule Deer</b> <i>Big Game</i>	0.62	SI per Covertypes	12.9	6.4	0.2	6.6
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	1.00	SI per Covertypes	20.8	10.4	0.0	10.4
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.39	SI per Covertypes	8.7	4.4	0.0	4.4
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.54	0.54	0.2	0.1	0.0	0.1
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-18

**Table A-19.** Preliminary HEP Results for Windmill Ranch (Site: 665)

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED EXISTING HU's	DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.90	0.90	2.7	1.4	1.8	3.2
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.42	0.42	1.3	0.6	0.8	1.5
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.67	0.90	12.1	6.0	12.2	18.3
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.33	0.33	8.9	4.5	3.0	7.4
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.26	SI per Covertypes	247.8	123.9	156.4	280.3
<b>Mule Deer</b> <i>Big Game</i>	0.24	SI per Covertypes	235.5	117.7	31.4	149.1
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.13	SI per Covertypes	193.9	97.0	97.2	194.2
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.17	SI per Covertypes	115.0	57.5	87.9	145.4
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.30	0.30	7.8	3.9	2.1	6.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.50	0.50	0.0	0.0	8.9	8.9

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-19

**Table A-20.** Preliminary HEP Results for Central Ferry Dry Development

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.16	0.42	16.3	8.1	104.1	112.3
<b>Mule Deer</b> <i>Big Game</i>	0.23	0.12	23.4	11.7	34.1	45.8
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.00	0.47	0.0	0.0	88.9	88.9
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-20

**Table A-21.** Preliminary HEP Results for the John Henley HMU

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI MULTIPLIER	EXISTING HU's	CREDITED EXISTING HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.90	0.84	1.8	0.9	24.9	25.8
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.17	0.15	85.2	42.6	93.6	136.2
<b>Mule Deer</b> <i>Big Game</i>	0.28	0.04	145.3	72.7	23.7	96.4
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.36	0.0	0.0	220.6	220.6
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.01	0.37	3.4	1.7	249.3	251.0
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.27	0.09	80.4	40.2	27.7	67.9
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-21

**Table A-22.** Preliminary HEP Results for the Kelly Bar HMU

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.20	0.36	0.4	0.2	1.0	1.2
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.90	0.14	18.2	9.1	3.4	12.5
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.26	1.8	0.9	0.7	1.6
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.21	0.07	44.2	22.1	13.2	35.3
<b>Mule Deer</b> <i>Big Game</i>	0.11	0.08	24.7	12.4	18.3	30.6
<b>Chukar</b> <i>Upland Gamebird</i>	0.40	0.19	100.8	50.4	46.9	97.3
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.04	0.07	8.8	4.4	16.6	20.9
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.09	0.05	5.6	2.8	3.5	6.3
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-22



**Table A-23.** Preliminary HEP Results for the Mill Creek HMU

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.00	1.00	0.0	0.0	5.3	5.3
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.00	1.00	0.0	0.0	6.0	6.0
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.00	0.96	0.0	0.0	5.1	5.1
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.02	0.76	0.0	0.0	35.6	35.7
<b>Mule Deer</b> <i>Big Game</i>	0.04	0.37	0.0	0.0	21.5	21.6
<b>Chukar</b> <i>Upland Gamebird</i>	0.43	0.00	0.4	0.2	0.0	0.2
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.00	1.00	0.0	0.0	63.0	63.0
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.00	0.90	0.0	0.0	56.7	56.7
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Data collected from 1991-1995, Corps,WDFW, Unpublished

L-A-23

**A-24.** Preliminary HEP Results for the Nisqually John Canyon HMU

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI MULTIPLIER	EXISTING HU's	CREDITED EXISTING HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.90	0.01	80.5	40.2	0.7	41.0
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.90	0.03	78.7	39.3	3.1	42.4
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.90	0.01	80.5	40.2	0.7	41.0
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.33	0.04	804.9	402.5	88.3	490.8
<b>Mule Deer</b> <i>Big Game</i>	0.37	0.11	969.4	484.7	284.2	768.9
<b>Chukar</b> <i>Upland Gamebird</i>	0.72	0.01	2138.6	1069.3	20.5	1089.8
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.76	0.02	2001.0	1000.5	41.2	1041.7
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.53	0.00	1155.9	577.9	0.0	577.9
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Values from US Fish and Wildlife Service HSI Validation Report 1995

L-A-24

**A-25. Preliminary HEP Results for Rice Bar**

<b>EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION</b>	<b>EXISTING HSI</b>	<b>POST DEVELOPMENT HSI</b>	<b>EXISTING HU's</b>	<b>CREDITED HU's</b>	<b>POST DEVELOPMENT HU's</b>	<b>TOTAL CREDITED HU's</b>
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.10	0.62	0.0	0.0	7.9	7.9
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.35	0.65	7.0	3.5	23.3	26.8
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.20	0.98	0.0	0.0	12.4	12.4
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.66	0.0	0.0	3.4	3.4
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.26	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.16	0.51	6.1	3.0	76.4	79.4
<b>Mule Deer</b> <i>Big Game</i>	0.28	0.34	16.2	8.1	69.2	77.4
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.16	1.00	33.7	16.8	210.5	227.3
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.20	0.71	42.1	21.1	149.5	170.6
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI values from Preliminary HEP-Corps, 1994, Unpublished

L-A-25

**Table A-26.** Preliminary HEP Results for Swift Bar

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.00	0.02	0.0	0.0	0.0	0.0
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.00	0.68	0.0	0.0	6.5	6.5
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.00	0.80	0.0	0.0	1.9	1.9
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.16	0.49	12.8	6.4	53.0	59.4
<b>Mule Deer</b> <i>Big Game</i>	0.21	0.34	16.8	8.4	40.2	48.6
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.00	0.42	0.0	0.0	54.0	54.0
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.16	0.65	8.0	4.0	71.5	75.5
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI variables derived from Preliminary HEP-Corps, 1994, Unpublished

L-A-26

**Table A-27.** Preliminary HEP Results for the Wallula HMU

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.00	1.00	0.0	0.0	4.3	4.3
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.00	0.84	0.0	0.0	38.6	38.6
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.00	1.00	0.0	0.0	4.3	4.3
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.77	0.04	5.8	2.9	0.3	3.1
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.45	0.46	0.0	0.0	0.0	7.9
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.33	0.52	5.4	2.7	63.6	66.3
<b>Mule Deer</b> <i>Big Game</i>	0.35	0.37	8.4	4.2	66.1	70.3
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.48	1.00	11.5	5.7	188.0	193.7
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.08	0.81	14.4	7.2	146.3	153.5
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI Data collected from 1991-1995, Corps,WDFW, Unpublished

L-A-27

**Table A-28.** Preliminary HEP Results for Willow Bar

EVALUATION SPECIES HABITAT OR GUILD ASSOCIATION	EXISTING HSI	POST DEVELOPMENT HSI	EXISTING HU's	CREDITED HU's	POST DEVELOPMENT HU's	TOTAL CREDITED HU's
<b>Downy Woodpecker</b> <i>Riparian Forest</i>	0.00	0.02	0.0	0.0	0.0	0.0
<b>Song Sparrow</b> <i>Mesic Shrubland</i>	0.00	0.68	0.0	0.0	1.2	1.2
<b>Song Sparrow</b> <i>Riparian Forest Understory</i>	0.00	0.80	0.0	0.0	0.3	0.3
<b>Yellow Warbler</b> <i>Scrub-shrub Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Marsh Wren</b> <i>Emergent Wetland</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>River Otter</b> <i>Furbearer/Shoreline Cover</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Western Meadowlark</b> <i>Shrubsteppe/Grassland</i>	0.16	0.46	0.0	0.0	13.4	13.4
<b>Mule Deer</b> <i>Big Game</i>	0.24	0.34	0.0	0.0	10.7	10.7
<b>Chukar</b> <i>Upland Gamebird</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>California Quail</b> <i>Upland Gamebird/Riparian Juxtaposition</i>	0.00	0.25	0.0	0.0	9.2	9.2
<b>Ring-necked Pheasant</b> <i>Upland Gamebird</i>	0.10	0.61	3.7	1.8	22.2	24.1
<b>Mallard</b> <i>Shoreline Cover/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0
<b>Canada Goose</b> <i>Shoreline Pasture/Islands</i>	0.00	0.00	0.0	0.0	0.0	0.0

HSI values derived from Preliminary HEP-Corps 1994, Unpublished

L-A-28

**Annex B**  
**Tabulation of Facilities of Lower Snake River Fish and Wildlife  
Compensation Plan Lands**

**Table B-1.** Tabulation of Facilities-Western Project; McNary, Ice Harbor and Lower Monumental Pools

Pool/River Mile	HMU (Acres)	Plantings (Acres)	Nest Boxes (Qty) Type	Goose Tubs (Qty)	R.M.	Guzzlers (G) Quail Roosts/Brush Piles (QR)	Irrigation	Miles of Fence
<b>Ice Harbor Pool</b> (2032)		Food Plot (26.5)	Total Boxes (67)	(18)		17G	4 Pumps	8.00
TOTALS		Trees/Shrubs (280.0)				11QR	356 Risers	
		Meadows (107.5)					440 Irrigated Acres	
		Pastures (22.5)						
9.7S	Headquarters(1)					1G		
						1QR		
11S	Charbonneau(100)			(0)	11-11.75S 1	1QR		
12N	Lake Charlene(57)							0.75
13N	Levey(30)			(1)	13.25N			
14.7-18N	Big Flat(895)	Food Plot(21.0)	(7) Bluebird	(3)	15.2-18N	4G	Electric Pumps	1.10
		Trees/Shrubs(166.0)	(9) Wren			4QR	(200&250hp)	
102		Meadows(67.0)	(4) Wood Duck				216 Risers	
		Pastures(7.5)	(2) Downy Woodpecker				2 Drip Systems	
			(10) Screech Owl				#1 (80 bubblers)	
			(1) Tree Swallow				#2 (250 bubblers)	
							APPROX. 3.5 AC.	
16S	Quarter Circle(89)					2G		1.16
						1QR		
18S	Fishhook(217)			(2)	18.75S	2G		2.0
						1QR		
19N	Nineteen Mile(25)			(1)	19N			
22-25N	Lost Island(162)	Food Plots(3.0)	(4) Screech Owl	(4)	23N-24.3N	2G	1 Electric Pump	1.00
		Trees/Shrubs(35.0)	(3) Wren			1QR	(100hp)	
		Pastures(9.0)	(0) Downy Woodpecker				50 Risers	
		Meadows(17.0)	(2) Hairy Woodpecker					
			(4) Screech Owl					
			(1) Wood Duck					
24-26S	Hollebeke(247)	Food Plot(2.5)	(2) Bluebird	(4)	24.4S-25S	3G	1 Electric Pump	0.16
		Trees/Shrubs(79.0)	(4) Wren			2QR	(150hp)	
		Pastures(6.0)	(6) Downy Woodpecker				90 Risers	
		Meadows(23.5)	(5) Chickadee					
			(1) Screech Owl					
			(1) Common Flicker					
			(1) Wood Duck					

L-B-1



**Table B-1.** Tabulation of Facilities-Western Project; McNary, Ice Harbor and Lower Monumental Pools

Pool/River Mile	HMU (Acres)	Plantings (Acres)	Nest Boxes (Qty) Type	Goose Tubs (Qty)	R.M.	Guzzlers (G) Quail Roosts/Brush Piles (QR)	Irrigation	Miles of Fence
26N	Snake River Junction (26)							
30S	Walker(89)			(1)	30S	2G		1.5
29-34N	Couch Landing(93)			(2)	30-31.6N			
40S	Matthews Island(1)							
<b>Lower Monumental Pool</b> (2486)		Food Plots(6.5)	Total Boxes (36)	(21)		11G	3 Pumps	24.0
TOTALS		Trees/Shrubs(83.5)				8QR	135 Risers	
		Pastures(14.0)					158 Irrigated Acres	
		Meadows(55.0)						
45S	Megallon(132)							
45N	No Name(500)			(1)	45.2N			10.0
47-53N	Skookum(764)	Food Plots(3.0)	(6) Bluebird	(10)	47.2-48.8N	6G	1 Diesel Pump	4.0
		Trees/Shrubs(31.5)	(4) Wren			4QR	640gpm	
		Pastures(2.0)	(1) Downy Woodpecker				46 Risers	
		Meadows(13.0)	(2) Wood Duck					
			(2) Screech Owl					
			(1) Hairy Woodpecker					
			(1) Common Flicker					
52-55S	Ayer(185)			(4)	52-53.8S			
55-56N	55 Mile(295)	Food Plots(3.5)	(5) Bluebird	(6)	54.5-56.2N	3G	2 Electric Pumps	2.0
		Trees/Shrubs(52.0)	(8) Wren			3QR	(60 & 150hp)	
		Pastures(12.0)	(0) Downy Woodpecker				89 Risers	
		Meadows(42.0)	(1) Hairy Woodpecker					
			(1) Barn Swallow					
			(3) Tree Swallow					
			(1) Common Flicker					
			(0) Screech Owl					
			(0) Wood Duck					
56.5-58S	Joso(568)					2G		
						1QR		
58N	Lyons Ferry(42)							4.0

L-B-2

**Table B-2.** Tabulation of Facilities-Eastern Project; Lower Monumental, Little Goose, Lower Granite, and Dworshak Projects

Pool/RiverMile	HMU (Acres)	Plantings	(Acres)	NestBoxes	GooseTubs	R.M.	Guzzlers (G) Quail Roosts (QR) Brush Piles (BP) Goose Access Corridors (GAC)	Irrigation	Miles of Fence
<b>Lower Monumental Pool (1895)</b>									35
58.75-60S	Joso Eas26						2G		
	t								
62-63S	Tucannon(240)	Riparian	(80)		(2)	62.4S	4G		
		Wetland		(14)					
66-67.2S	Texas Rapids(54)						1G 2QR		
67-67.5N	Riparia(413)	Riparian/Pond	(20)		(2)	66.6N			
67.3N	AlkaliFlatCreek(211)	Riparian/Wetland	(4.0)						
67.5-69N	John Henley(919)	Mixed Pasture	(210)				4G		
		Dry Uplands	(757)				3QR		
<b>Little Goose Pool (3019.25)</b>									46.5
70.5-72S	Little Goose Landing (320)				(1)	73.3S	2G		
	(upstream to Hangar Gulch)				(1)	74S	2QR		
75.2S	Browns Gulch(90)	Riparian	(0.5)						*To be constructed
75.25-76S	Hangar-DryGulch(145)				(1)	76S			
75.9-77.4N	Ridpath(64)	Trees/Shrubs(3.7)			(1)	77.4N	1G	18 Risers	
		Meadows(6.5)					1QR		
		Mixed Pastures(12.5)					GAC		
		Food Plots(1.5)							
77.25-78.25S	Phalen-New York				(1)	77.4S	2G		
	Gulch(184)				(1)	78.5S			
					(1)	79.2S			
78.1-78.8	New York Island(47)				(1)	78.1			
78.25-81.7S	New York Bar(210)	Food Plot	(8.0)				3G	60 Risers	
		Trees/Shrubs	(30.5)				GAC		
		Meadows	(28.5)						
		Fields	(4.0)						

L-B-3

**Table B-2. Tabulation of Facilities-Eastern Project; Lower Monumental, Little Goose, Lower Granite, and Dworshak Projects**

Pool/RiverMile	HMU (Acres)	Plantings	(Acres)	NestBoxes	GooseTubs	R.M.	Guzzlers (G) Quail Roosts (QR) Brush Piles (BP) Goose Access Corridors (GAC)	Irrigation	Miles of Fence
83.4-84.5N	Central Ferry(296)	Mixed Pastures Grassland	(21.5) (296)				3G 3QR		
83S	Deadman/Meadow Creek(219)	Food Plot Wetland	(0.5) (25)		(6)	83S			
85-86.5N	Purrington(72)						2G		
86-88.5S	WillowBar(191)	Food Plot Trees/Shrubs Meadows	(17.0) (3.0) (89.0)		(1) (1)	86.5S 87S			
91.5-91.75N	Penawawa(74)	Riparian/Wetland	(32)						*To be constructed
91.75-94S	RiceBar(143)	Trees/Shrubs	(3.0)		(2)	92.5S			
94.4-94.5	Swift Island(.25)				(2)	93.4S			
94-97.5S	SwiftBar(364)	Food Plot Trees/Shrubs Meadows Fields Mixed Pastures	(6.8) (41.5) (18.0) (5.50) (31.5)		(1)	95.66 94.45	*2QR *2RP	62 Risers	
97.7-99.4N	Beckwith Bar(111)				(1) (1)	98.5S 98.9S			
99.5-101N	Shultz Bar(138)	Trees/Shrubs	(5.0)		(1)	100.8N	1G		*To be constructed
101.5-103S	Illia(351)	Trees/Shrubs	(1.5)				2G 2QR		
<b>Lower Granite Pool (4273)</b>									40
108.5-110S	Transmission Line(79)						1G		
116S	Knoxway Canyon(41)	Riparian	(3.0)						
119.5-121.2S	Kelly Bar(585)	Riparian	(6.0)				3G		
119.8	Centennial Island(2.5)				(3)	119.8			

L-B-4

**Table B-2.** Tabulation of Facilities-Eastern Project; Lower Monumental, Little Goose, Lower Granite, and Dworshak Projects

Pool/RiverMile	HMU (Acres)	Plantings	(Acres)	NestBoxes	GooseTubs	R.M.	Guzzlers (G) Quail Roosts (QR) Brush Piles (BP) Goose Access Corridors (GAC)	Irrigation	Miles of Fence
120.9-125N	Nisqually John Canyon(3077)	Riparian	(23)				6G 3QR		
123.0-124.2S	No Name(30)								
129-130N	Moses(44)				(1)	128.0N			
130.5S	Alpowa Creek(81)				(1)	128.0N			
131.3	Chief Timothy Islands(0.2)				(3)	131.3			
131.3-133.2S	Chief Timothy(66)	Food Plot	(0.5)				GAC	24 Risers	
		Trees/Shrubs	(11.2)						
		Meadows	(3.8)						
		Mixed Pastures	(10.0)						
	Silcott(160)						1G, 1QR		
134-135N	Wilma Water Tank(22)						1G		
138.2-138.3N	Confluence Island(6.5)				(1)	138.2			
					(1)	138.3			
146.5-147S	Asotin Slough(79)	Trees/Shrubs	(2.0)						
143.8-146.8	Hells Gate(650)	Trees/Shrubs	(4.0)				3G	45 Risers/Auto	
		Dry Shrub/Grass	(646)				4BP		
5.5-6.5N	Clearwater River	Trees/Shrubs	(2.0)		(3)				
	Goose Pasture	Dry Meadow	(12.0)						
	Lower(47)	Food Plot	(0.5)						
7.3-8.2N	Clearwater River	Trees/Shrubs	(1.5)		(2)		2BP	24 Risers/Auto	
	Goose Pasture5	Meadows	(3.5)				GAC		
	Upper (32)	Mixed Pastures	(6.5)						
		Food Plots	(0.5)						

L-B-5

**Annex C**

**1989 Letter of Agreement Between the State of Washington, the US Fish  
and Wildlife Service, and the Corps**

## LETTER OF AGREEMENT

### Wildlife Compensation Goals and Evaluation Measures

For The

### Lower Snake River Fish and Wildlife Compensation Plan

This Letter of Agreement (LOA) is made and entered into this 24<sup>th</sup> day of March, 1989 by and between the following parties: Department of Army - Corps of Engineers, Walla Walla District, hereinafter referred to as COE; U.S. Fish and Wildlife Service, hereinafter FWS; and Washington Department of Wildlife, hereinafter WDW. This LOA defines the procedure to establish habitat-based compensation objectives for the Lower Snake River Fish and Wildlife Compensation Plan (LSRFWCP).

Wildlife compensation efforts for the Lower Snake River Project have progressed under the authority of the LSRFWCP. The COE has undertaken intensive wildlife habitat development measures on 1,200 of 12,750 acres of project lands designated for "wildlife management" in COE project master plans. Of those 1,200 acres, 750 acres are irrigated. Developments include a variety of vegetative plantings, nesting and roosting structures, water cisterns, and irrigation systems. Wildlife habitat on additional project lands was improved through 93 miles of fencing along project boundaries. These initial developments as well as annual operation and maintenance costs have been borne by the individual COE lock and dam projects on which these habitat management areas occur.

Although animal losses were generally described in the LSRFWCP, it has been implemented without specific measurable objectives having been established other than the fee or easement acquisition of 23,400 acres off-project lands and the rearing and release of 20,000 game birds per year on LSRFWCP lands over a 20-year period.

Modifications to the LSRFWCP were recommended and contained in the report of the Chief of Engineers dated 6 March 1985 and approved by Congress in the Water Resources Development Act of 1986, Section 856 of Public Law 99-662. With respect to compensation of wildlife losses, these modifications were:

1. Expanded authority to purchase off-project lands (in fee as well as easements) and manage them in their entirety for wildlife purposes. Previously, the LSRFWCP provided that less than 2 percent of the off-project lands were to be owned in fee title and managed as production areas.

2. The game bird rearing and release program under the original authority was modified to allow a lump-sum payment to Washington Department of Wildlife in order for it to enter into lease agreements with southeastern Washington landowners for the establishment of game bird habitats and the opening of access to those lands for public hunting (Game Bird Farm Alternative (GFA), page 17, Special Report For Congress). The GFA will provide 18 years of increased wildlife production and public hunting recreation.

#### Article 1. Purpose and Scope.

The purposes of this LOA are to:

1. Determine the procedure for establishing measurable habitat-based compensation objectives.

2. Establish the criteria to be employed in a Habitat Evaluation Procedures (HEP) analysis for measuring progress toward compensation objectives from habitat development and/or land acquisition.

3. Establish the general procedure for crediting mitigation activities undertaken by the COE towards compensation.

4. Implement the recent modifications to the LSRFWCP approved by Congress in Section 856 of Public Law 99-662.

This agreement encompasses and is limited to wildlife compensation activities being undertaken pursuant to the LSRFWCP.

#### Article 2. Authority.

The COE enters into this agreement under the authority of the Water Resource Development Acts of 1976 (P.L. 94-587) and 1986 (P.L. 99-662), and in fulfillment of the Fish and Wildlife Coordination Act (FWCA), 16 U.S.C. 661-666c. Participation of the FWS and WDW is also authorized under the FWCA. Additionally, FWS and WDW were both recommended as cooperating agencies in the Special Report - LSRFWCP (U.S. Army Engineer District, Walla Walla, 1975) for implementation of the LSRFWCP. The FWS has conferred with affected Indian Tribes regarding this LOA and related issues and will continue this process during implementation of the LOA.

#### Article 3. Obligations and Responsibilities of the Parties.

Obligations and responsibilities of each party as related to the compensation analysis described by this LOA are detailed in scopes of work specific to each party. The COE will fund WDW and FWS for their efforts in the establishment of compensation objectives and the determination of compensation progress as discussed in this LOA. Additional funding or other support is

not authorized nor implied through this LOA. Future evaluations of compensation progress should use the criteria in this LOA as a basis for those evaluations.

1. The signatory parties agree that a modified HEP, based on existing Federal, state, and tribal wildlife programs and objectives, will be used in the implementation of the LSRFWCP with regard to wildlife compensation.

2. The signatory parties agree to work cooperatively as a HEP team to establish compensation objectives, coordinate mitigation recommendations, and evaluate mitigation actions.

3. The objectives for wildlife compensation under the LSRFWCP will primarily be based on Habitat Units (HU's) derived from the HEP analysis initiated in 1988. The HEP team will determine evaluation species and cover types used to define compensation goals and measure compensation progress. HU's existing during 1958 (pre-project) within current project boundaries will be determined by the HEP team from aerial photography and by sampling areas that represent pre-project conditions. The HU's derived from this procedure will constitute the compensation objectives for the LSRFWCP. Compensation progress to date for on-project lands will similarly be determined by using 1987 aerial photography and sampling of project lands.

4. Compensation will be met through present and future on-project habitat developments, acquisition of off-project lands and subsequent development, or riparian/wetland habitat protection. Consideration of acquisition and habitat development of off-project land will depend upon (1) the on-project land base available for additional habitat development, (2) land availability (willing sellers), (3) existing habitat condition and/or development potential and/or status in regard to future expected land use, (4) proximity of off-project parcels in relation to the Lower Snake River, and (5) cost-effectiveness. These determinations will be made jointly by the signatory parties of this LOA.

5. Future expected HU's gained through development of on- and off-project lands will be fully credited to the LSRFWCP immediately following the completion of habitat development. The signatory parties agree to focus acquisition on lands having minimal existing HU's, but good potential for habitat development. These acquisitions will receive credit toward compensation for one-half (50 percent) of their existing HU's for evaluation species. However, the signatory parties also recognize that habitat protection of existing high quality riparian/wetland habitat will be justified when such habitat is potentially threatened by land use changes or practices. In these case-specific instances, all



(100 percent) of the existing HU's for evaluation species associated with riparian/wetland habitats will be credited toward compensation. WDW and FWS are willing to depart from usual practice and agree to the above 50 percent and 100 percent credits for acquisition. This departure from usual practice is necessary to direct the acquisitions to appropriate lands, and applies only to this agreement with COE.

6. Each future off-project acquisition and/or habitat management action proposed will be evaluated based on a cost/benefit comparison using potential HU's derived from the proposed action. The 50 percent credit for existing habitat values will not be incorporated into any cost/benefit assessment.

7. Habitat development progress will be monitored on each parcel to determine the HU's achieved. This information will help guide future efforts through identification of successful development methods upon which to focus. Monitoring procedures, schedules, and agency responsibilities will be determined as part of the development of the planning guidelines phase of the compensation analysis.

8. "Interim" compensation is the replacement of wildlife-oriented recreation values lost due to the project from the time of construction until mitigation habitats are fully productive. The signatory parties agree that interim compensation will be fully satisfied through the implementation of the Game Bird Farm Alternative (GFA) described above, and through the perpetual easement purchase and development of the Bailie Memorial Youth Ranch in Franklin County. However, the HU's resulting from the habitat developments on the Bailie Memorial Youth Ranch in 1987 will be credited toward compensation under the LSRFWCP.

9. Wildlife compensation measures implemented through the LSRFWCP will be accomplished within presently authorized acreage (24,150 acres) and cost levels (current estimate for acquisition and development). Interim compensation measures are in addition to these costs. The report prepared under this LOA will not recommend mitigation/compensation measures above these currently authorized levels.

10. A General Plan for the Lower Snake River Project will be prepared in accordance with the Corps of Engineers "Engineering Regulation 1130-2-435, Preparation of Project Master Plans" and the Fish and Wildlife Coordination Act. The General Plan will be prepared by the end of calendar year 1991, following the completion of the HEP analysis described through this LOA. The purpose of this plan is to identify lands to be managed for mitigation under the LSRFWCP, direct development and management of those lands, and identify agency roles and responsibilities in implementation of actions contained in the General Plan. Because land acquisitions for wildlife compensation will not be accomplished by the conclusion of the HEP evaluation when the General

Plan is developed, supplements to this General Plan will be made as land acquisitions are completed. Land acquisition and development will not be delayed while the General Plan is being developed.

Article 4. Relationship of the Parties.

This LOA is specific to the LSRFWCP and in no way shall interfere, disrupt, or restrict other authorized functions or activities of the agreeing parties. This LOA does not restrict any of the parties from seeking additional mitigation measures for the Lower Snake River Projects through other programs.

Article 5. Availability of Funds.

Implementation of this agreement shall be subject to the availability of appropriated funds.

Article 6. Elected Officials Not to Benefit.

No member of or delegate to Congress, or resident Commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise from it.

Article 7. Effective Term.

This LOA shall take effect upon execution by all of the three signatory parties identified herein, and, unless amended in accordance with Article 8 hereof, shall remain in effect until compensation authorized by the LSRFWCP is completed.

Article 8. Amendments and Termination.

This LOA may be amended in writing at any time with the written consent of the three signatory parties. Any such amendment shall take effect upon execution by all of the three signatory parties. Any signatory party may terminate this agreement for breach of any article herein by giving at least 90 days advance written notice to the other signatory parties.

IN WITNESS WHEREOF, the signatory agencies have executed this agreement as of the date last set forth below and agree to abide by its terms from that date forward.

Curt Smitch  
Curt Smitch, Director  
Washington Department of Wildlife

3/13/89  
Date

Wally Steuche  
Marvin Plenert, Regional Director  
U.S. Fish and Wildlife Service

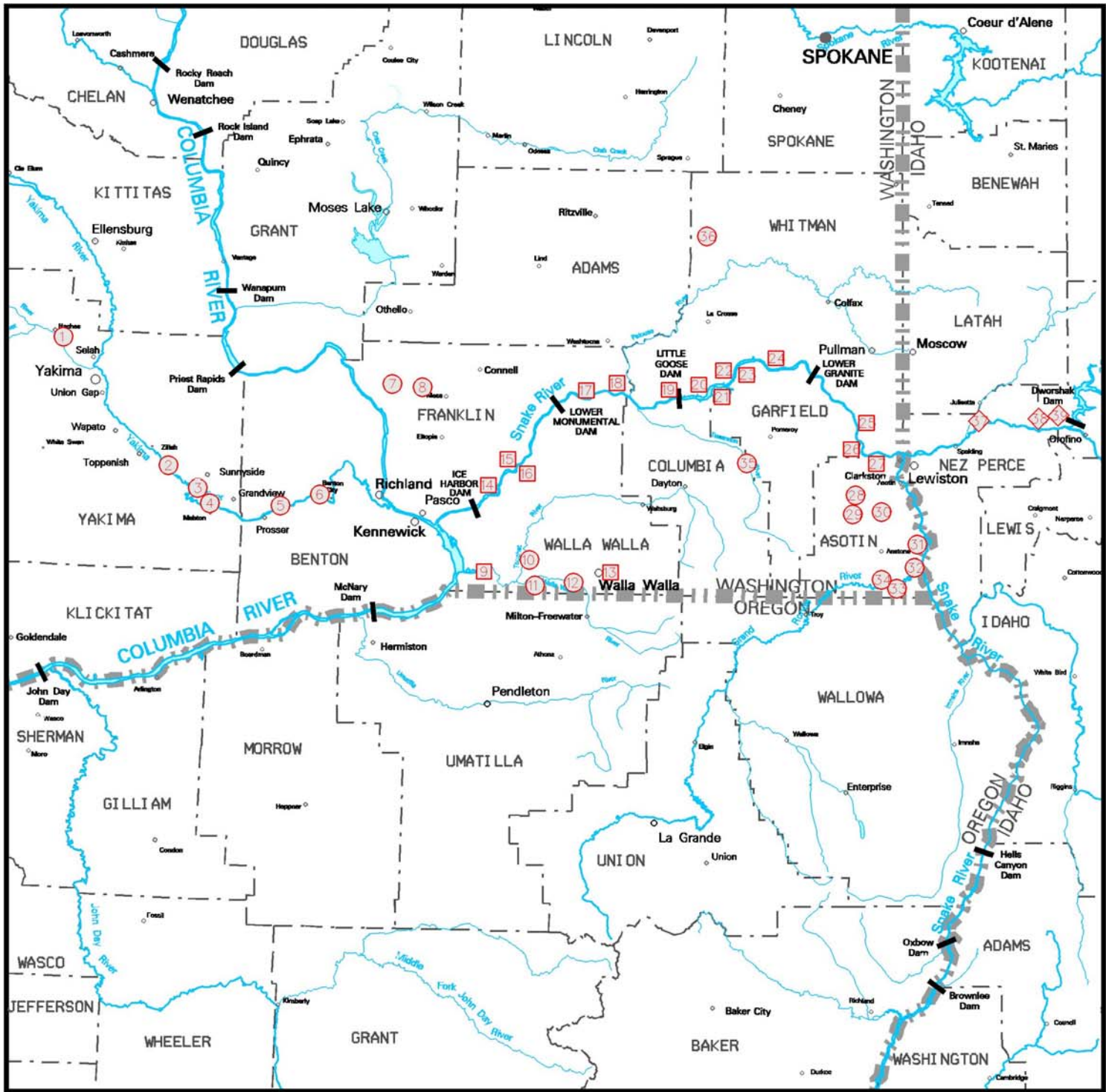
3-22-89  
Date

James A. Walter  
James A. Walter  
Lieutenant Colonel, Corps of Engineers  
District Engineer  
Walla Walla District

24 Mar '89  
Date

**Annex D**

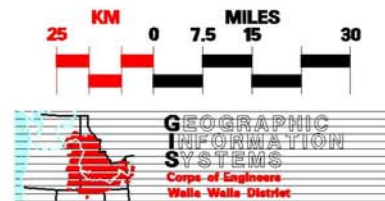
**Lower Snake River Fish and Wildlife Compensation Plan Lands for  
Terrestrial Wildlife and Resident Fish Mitigation**



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**HABITAT MANAGEMENT UNIT**

- US Army Corps of Engineers Owned
- WA Dept. of Fish and Wildlife Owned
- To Be Developed

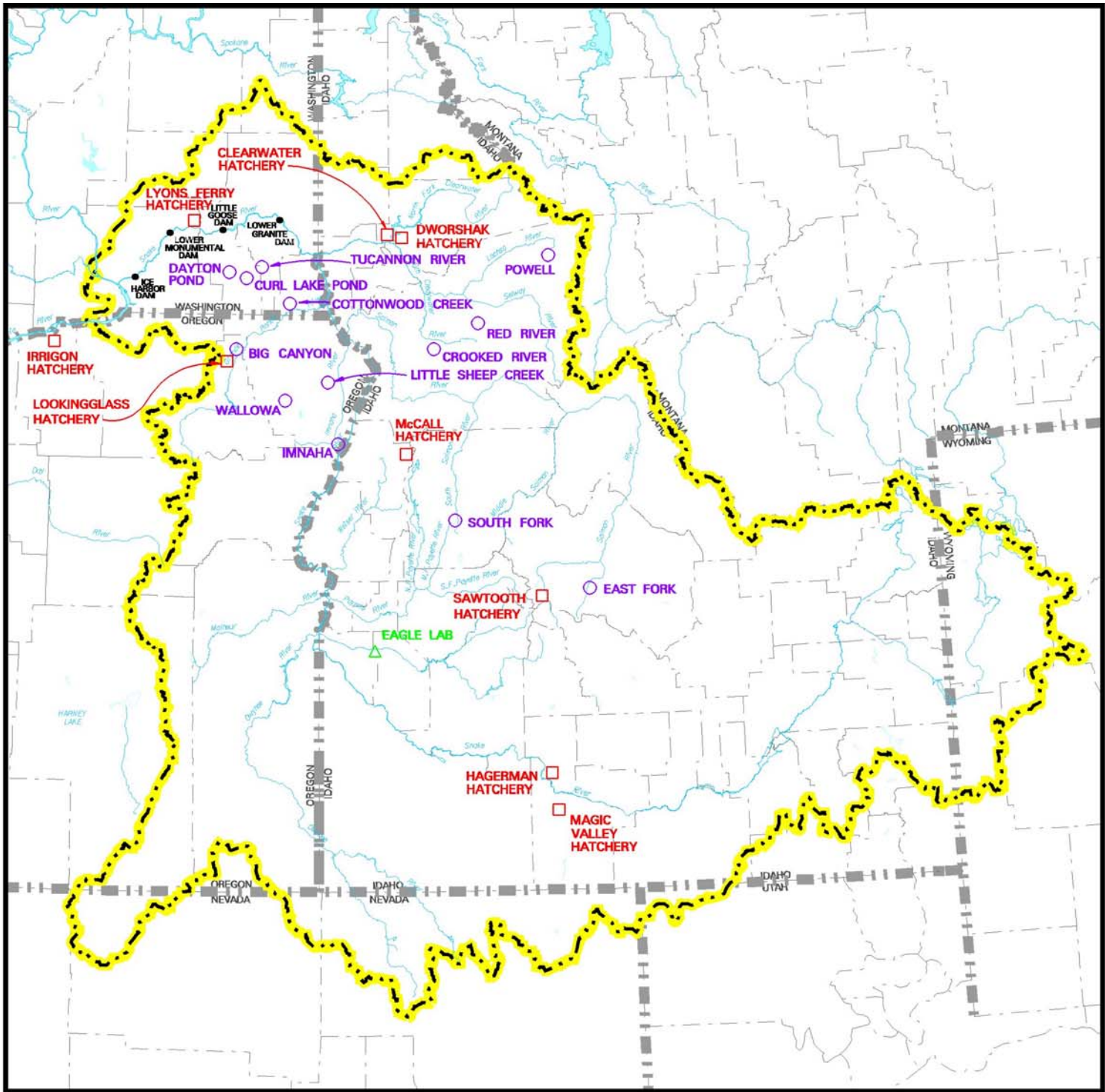


**LOWER SNAKE RIVER  
Juvenile Salmon Migration Feasibility Study**

Figure 1.

**REGIONAL HABITAT  
MANAGEMENT UNITS**





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**SATELLITE** ○

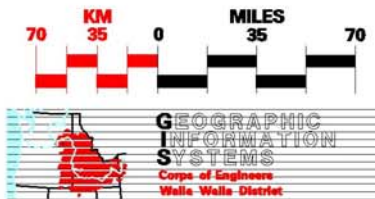
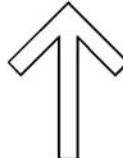
- South Fork A
- East Fork B
- Wallowa C
- Big Canyon D
- Imnaha E
- Little Sheep Creek F
- Dayton Pond G
- Curl Lake Pond H
- Tucannon River I
- Cottonwood Creek J
- Red River K
- Crooked River L
- Powell M

**HATCHERY** □

Hatchery Name	Associated Satellite
McCall Hatchery	A
Magic Valley	B
Hagerman Hatchery	B
Lookingglass Hatchery	E
Irrigon Hatchery	C,D,F
Lyons Ferry Hatchery	G,H,I,J
Dworshak Hatchery Expansion	A
Sawtooth Hatchery	(None)
Clearwater Hatchery	K,L,M

**FISH DISEASE LABORATORY** ▲

**DISTRICT BOUNDARY** - - -



490,000 ACRES

1 : 53,222,400

LOWER SNAKE RIVER Juvenile Salmon Migration Feasibility Study

Figure 2. **REGIONAL HATCHERIES**