US Army Corps
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Walla Walla District

Lower Snake River Fish and Wildlife Compensation Plan
Habitat Evaluation Procedure
2001-2002 Terrestrial Analysis
Southeast Washington

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Abstract

Lands associated with terrestrial wildlife habitat and angler access for the Lower Snake River Fish and Wildlife Compensation Plan (Comp Plan) were analyzed in 2001 to 2002 using the Habitat Evaluation Procedure. The lower Snake River acreages were expanded from a US Army Corps of Engineers study done in 1991 to include all Comp Plan lands. All XYZ lands (lands acquired for development aimed at upland bird habitat and angler access) were studied individually to provide the first measured habitat evaluation of these parcels. The 1958 baseline was left unchanged from the 1991 study. Comparisons were made between the 1989 interim condition and present condition on the lower Snake River. Comparisons were also made between the 1995 (base condition) and present condition on XYZ lands. For the lower Snake River, it is evident there have been gains since 1989 for all species except mallard, but only half the species show gains on XZY lands since 1995. The overall Comp Plan mitigation balance shows a habitat unit (HU) deficit for California quail, Canada goose, downy woodpecker, mallard, ring-necked pheasant and yellow warbler. Chukar partridge, marsh wren, mule deer, river otter, song sparrow, and western meadowlark exhibited HU surpluses when compared to the 1958 base condition. Specific management will help improve or protect habitat for all species except chukar partridge and river otter. These two species have significant surpluses and, given the present condition of habitat, further management will not significantly improve or protect this habitat. Species such as Canada goose and mallard will not realize any habitat improvement on the lower Snake River lands. Improvements could be realized on a few of the X land parcels managed within Washington State Habitat Management Areas. Ring-necked pheasant, mule deer, and western meadowlark will realize habitat improvements by management toward native shrub-steppe habitat, where appropriate. Downy woodpecker, song sparrow, and yellow warbler will benefit from development and enhancement of native riparian forest and willow scrub shrub habitat. California quail will also benefit from this, but still needs additional mesic shrub and food plot developments.

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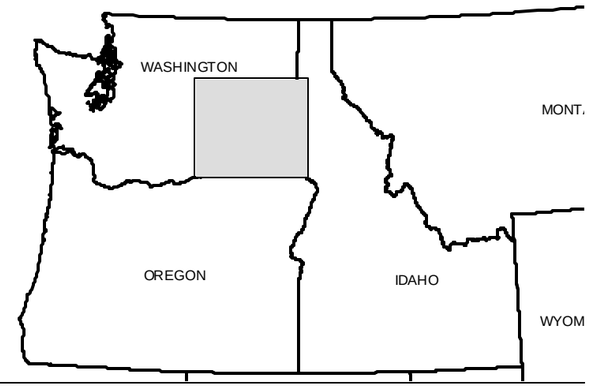
1.0 Introduction

The terrestrial portion of the Lower Snake River Fish and Wildlife Compensation Plan (Comp Plan), drafted in 1975, was divided into several programs. At the time, mitigation was based primarily on hunting and fishing use, as well as upland animal numbers. The terrestrial portion was divided into two primary development. The first area is Corps-owned land on the lower Snake River, and the second area is parcels acquired off of Corps-owned land for development targeted at upland bird species and angler access (XYZ lands). Mitigation monitoring techniques used on these lands shifted in the late 1980s, when the Habitat Evaluation Procedure (HEP) was initially used. The outcome of this effort was published in *Lower Snake River Fish and Wildlife Compensation Plan: Wildlife Habitat Compensation for the Lower Snake Project* (Corps, 1991; hereinafter referred to as the 1991 Report). The current effort is the first documented update of the Comp Plan terrestrial habitat since the1991 Report. The 1991 Report measured habitat quantity and quality along the lower Snake River only, and set the baseline for terrestrial mitigation. Some estimates of the habitat value of the XYZ lands were generated during the mid 1990s. A compilation of this data was discussed in Appendix L, "Lower Snake River Mitigation Status and History," of the *Lower Snake River Juvenile Salmon Migration Feasibility Study/Environmental Impact Statement* (Corps, 2002). This effort is the first to apply a measured HEP evaluation that covers the Lower Snake River Project and XYZ Lands. Plate 1 depicts the areas studied in this investigation.

2.0 Background of Comp Plan Lands Used for Terrestrial Mitigation

The Comp Plan directed that lands on the lower Snake River, and other lands purchased and leased in adjacent areas of southeast Washington, be developed for terrestrial wildlife habitat development and maintenance. As a result, approximately 25,000 acres of Corps lands along the lower Snake River were set aside for this purpose. Another 24,000 acres of lands were also purchased or leased for terrestrial wildlife habitat development and angler access (XYZ Lands).

The lands along the lower Snake River were developed to provide habitat for many game and non-game species. 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 8,936 acres), 22 received some level of development. Of these 22, 10 HMUs (totaling 3,258 acres) were developed and maintained on an intensive level. Approximately 1,100 acres were planted within these intensive HMUs, with 960 acres under irrigation. The sites were developed according to the *Design Memorandum for Wildlife Habitat Development* (Corps, 1975) and its supplement (Corps, 1979).



STUDY LANDS

Corps of Engineers
- Lower Snake River Lands

S XYZ Lands

Kilometers 20 10 0 10 20 30
Miles

Lower Snake River Fish & Wildlife Compensation Plan

Habitat Evaluation Procedure

STUDY AREA

2002

Plate 1 of 69

The term X, Y and Z (XYZ) lands was used initially in Design Memorandums 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 State of Washington in fee or easement to compensate for angler access losses.

Element X required the purchase of 400 acres of riparian habitat and 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 an easement for 15,000 acres of chukar habitat along the Snake River breaks to provide access for public hunting. Some minor developments (*i.e.*, sanitation facilities, fencing, brush piles, water catchments, and parking lots) would be constructed on portions of the acquired properties.

Element Z required the purchase of 700 acres in Washington, in small parcels, to provide angler access. Some minor developments (*i.e.*, sanitation facilities, fencing and parking lots) would be constructed on portions of the acquired land.

Since 1987, over 23,000 acres of land have been purchased or leased on 14 sites for X and Y land development. In addition, approximately 700 acres in 15 parcels were purchased or leased in southeastern Washington, with all or part of these parcels designated for angler access. Most XYZ lands are currently owned and operated by the Washington Department of Fish and Wildlife (WDFW). Habitat developments and other facilities were also constructed on these lands using Corps funding. A full listing of these lands, along with approximate acreages, are listed in Table 1.

The lands included in this HEP evaluation are the lower Snake River lands within Corps management jurisdiction, as well as those lands listed in Table 1 that are not easements. Bailie Ranch was included since developments were performed at this site, which are creditable to terrestrial mitigation.

Table 1: Comp Plan XYZ Lands					
	Primary Credit Type		Total Area in Acres		
			Acquisition Type		
Management Areas		WA County	Fee Title	Easement	Other[1]
Asotin Creek Easements PFA[2]	Z	Asotin		12.5	
Bailie Ranch HMA[3]	X	Franklin		3,828.0	
Benton City PFA	Z	Benton	17.0		
Burma Road PFA	Z	Okanogan	1.7		
Campbell Unit HMU[4,5]	Y	Asotin	564.0		
Central Ferry HMU	X	Whitman	287.0		
Couse Creek PFA	Z	Asotin	3.0		
Donald Road PFA	Z	Yakima	75.5		
Eight Mile Touchet River PFA	Z	Walla Walla		2.4	
Ferry Road PFA	Z	Yakima	118.8		
Fisher Gulch Unit HMA	Y	Asotin	1,860.0		
Hartsock Unit HMA[5]	Y	Columbia	2,458.0		
John Henley HMU[5]	Y	Whitman	752.0		
Kelly Bar HMU	Y	Garfield	235.0		
McDonald Bridge PFA	Z	Walla Walla	120.4		
Mill Creek HMU	X	Walla Walla	62.0		
Naches Road PFA	Z	Yakima	8.0		
Nisqually John Canyon HMU	Y	Whitman	3,051.4		
Pintler Creek HMA	Y	Asotin	4,362.0		
Revere Ranch HMA[5]	X	Whitman	2,187.0		
Rice Bar HMU		Whitman			224.0
Shumaker Unit HMA[5]	Y	Asotin	2,054.0		
Sulphur Creek PFA	Z	Yakima	06/-		
Swank PFA	Z	Asotin	32.0		
Swegle Road PFA	Z	Walla Walla	93.0	35.3	
Wallula HMU	X	Walla Walla	182.0		
Whitstran PFA	Z	Benton	17.5		
Willow Bar HMU		Whitman			40.5
Windmill Ranch HMA	X	Franklin	1,553.0		
		Totals:	**20,190.3**	**3,878.2**	**265.4**
Approximate Totals by Credit Type:					
X Lands: 8,207.4		**Y Lands: 15,166.8**		**Z Lands: 694.6**	

[1]Rice Bar and Willow Bar were purchased to mitigate for the sale of Wilma HMU.
[2]Public Fishing Area (managed by WDFW)
[3]Habitat Management Area (off-project managed by WDFW)
[4]Habitat Management Unit (on-project land managed by the Corps)
[5]Some credit has been given to X or Z lands due to pheasant habitat development or angler access at this site. The site totals reflect this, although the individual acreages have not been shown. The acres of XYZ lands are based on current mapping. These boundaries have not been ground-truthed, so are considered approximations.

3.0 Background of Data Collection and Observations

3.1 Cover Type Mapping

A list of cover types used in this evaluation is shown in Table 2, and methods for delineations and updates are discussed below. Table 2 represents the master list used for delineation.

Table 2
Cover Types

Cover Type	Abbreviation
Riparian Forest	PF
Mesic Shrubland	MS
Palustrine Scrub-Shrub	PSS
Palustrine Emergent	PE
Shrub-Steppe High (> 35% aerial cover)	SSH
Shrub-Steppe Low (< 35% aerial cover)	SSL
Palustrine Open Water	POW
Lacustrine	LOW
Riverine	ROW
Grassland	G
Pasture	P
Forbland/Grass	AFG
Orchard	O
Agricultural Crop	AC
Unconsolidated Shore	US
Rock Talus/Exposed Rock	RT/ER
Sand Dune	SD
Residential/Industrial	RI
Recreational	RE
Quarry	Q
Railroads/Primary Roads	RR/PR
Riprap	RP
Shoreline (75 and 100 meters wide)	SHOR

In 1989, cover type mapping was delineated onto mylar covering 1958 and 1987 uncontrolled photography of the Lower Snake River Project lands. The 1958 photography was black and white, so delineations were aided by the use of black and white aerial oblique photography from the same period. The 1987 photography was natural color, with delineations aided by ground truthing. Using zoom transfer scopes, this data was transferred to 1:24,000 orthophotoquads.

The orthophotos were then scanned and warped into a Geographic Information System (GIS) to fit the Washington State Plane (1927, Washington South) geographic coordinate system. Cover type acreage figures for 1958 and 1989 were derived from this data.

The 1958 cover type acres were derived from the contractor's totals in 1989, which were used in the 1991 Report. The 1958 total acres were lower than what is depicted in 1989 and 2001. This was due in part to the fact that additional coverage was mapped in 1989 and 2001. The main area of difference was the Palouse Falls Quadrangle on the Lower Monumental pool. The 1958 photos did not cover this area as well as other areas of the lower Snake River. The areas were not cover typed, and are not included as a part of the base mitigation.

The 1989 acreage figures in the 1991 Report were calculated to match the 1958 photography coverage as closely as possible. These acreages were recalculated for this report to include all areas mapped in 1989. This was done to show a better comparison of the acres between 1989 and 2001. Acreage breakdown of all areas included in this report are found in Appendix A. Cover type plates for all areas covered in this report are found in Appendix B.

3.2 Field Sampling

Field sampling was performed to collect data for the 12 species listed in Table 3. The measured HEP protocol [US Fish and Wildlife Service (USFWS), 1980] was used based on the species model variables. A team of biologists from the Corps, USFWS, and Washington Department of Fish and Wildlife (WDFW) developed the list of species based on their ability to be realistic indicators of natural conditions as well as waterfowl, upland, and big game targets for the region. Some of the models (*i.e.,* yellow warbler, downy woodpecker, and marsh wren) were unaltered models developed by the USFWS. California quail, chukar partridge, song sparrow, mule deer, river otter, western meadowlark, and ring-necked pheasant models were modified for the lower Snake River investigation in 1989. Mallard and Canada goose models were developed by the HEP team (Corps, WDFW, USFWS). The models used for the 2001 investigation have been left unchanged from the 1991 Report.

Table 3
Evaluation Species and Cover Types Used

Variable	Cover Type												
	PF	PSS	PE	SHOR	POW	MS	AG	SSL	SSH	G	RT/ER	AC	P
Mule Deer	X	X				X	X	X	X	X			
California Quail	X	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									

The original field sampling for Habitat Suitability Indexes (HSI) variables on the lower Snake River was conducted in April and May of 1989. Pre-project variables were collected at nearby riparian areas on free-flowing rivers (including Hells Canyon), or on

Corps-owned lands on the lower Snake River in representative areas for non-riparian variables. Existing habitat variables for the 1989 data set were collected at random sites along the Snake River, within Corps project lands.

It was decided initially that the areas encompassing the lower two pools (Ice Harbor and Lower Monumental) and the upper two pools (Little Goose and Lower Granite) would be treated as individual units. Data collection was performed with this in mind. Herbaceous vegetation was collected at sampled cover types. Physical data such as distance to water, topographic class, distance to mesic shrubland, distance to escape cover, *etc.*, were collected independently in the field or from measurements made on orthophotography in the office.

3.3 Data Calculation

The initial HEP was calculated using USFWS HEP software. Many assumptions and unique data applications were applied to generate the final HEP numbers for the 1991 Report. The original field data was not re-entered to test these assumptions. These data were referred to if discrepancies could not be solved through other means. The assumptions are based on a raw data set contained in a Dbase III+ table (1989 database). Field data for both the 1958 and 1989 calculations is found there. The other source of measurements was found on the USFWS HEP software printouts generated for the 1991 Report.

Species Models, Data Calculations, Assumptions as Applied to All Datasets

To ensure that models in the current Access database were calculating the same way as they did for the 1991 Report, each species model was used to recalculate the 1958 and 1989 data using the 1989 database. The results were compared to the outcomes in the 1991 Report. If there were discrepancies, the models were checked first, then the data, then the original HEP printouts to find where the errors were. In this way, the models, Access database and, finally, the data were refined to come as close as possible to matching the 1991 Report results. If, after all avenues were exhausted, discrepancies still existed, changes were made to the results of the 1958 and 1989 data. Each species model is listed in Table 3 and described below, along with the specific cover types sampled for each species. Table 4 is a list of the variables for which data were collected, the methods used, and the cover type in which the information was gathered from the 1991 Report. The observations and assumptions made to create the present results from the Access database are also addressed in subsequent paragraphs.

Table 4
Variables from the 1991 Report

Variable	Method Used	Cover Type
VCVSH07 – shrub canopy ≤ 1.5 m high	50 m line intercept in cm measured to nearest cm	SSL, SSH, MS, PEM, PSS
CVSHOP – canopy cover of shrub < 1.5 m preferred by deer	50 m line intercept in cm measured to nearest cm (includes rabbitbrush, sagebrush, willow, rose, and bitterbrush)	SSL, SSH, MS, PEM, PSS
VCVSH01 – canopy cover of shrubs < 6 m	50 m line intercept in cm measured to nearest cm (included dead shrubs)	F, G, SSL, SSH, MS, PEM, PSS
VCVSH02 – canopy cover of deciduous shrubs	50 m line intercept in cm measured to nearest cm (live shrubs only)	PSS
VRCSH01 – canopy cover of hydrophytic shrub	50 m line intercept in cm measured to nearest cm (Includes willow, cottonwood, locust, elder, and olive – live shrubs only)	PSS
VCVTR07 – cover of hydrophytic shrub	50 m line intercept in cm measured to nearest cm	PEM, PSS
VHTSH01 – height of shrubs < 5 m in overstory canopy	50 m line intercept in cm measured to nearest 1/10 m, 3 times along each intercept. If there were not three shrubs on intercept, used nearest shrubs to the transect within a 100 m limit.	SSL, SSH, MS, PSS, PFO
VHTSH05 – height of deciduous shrubs < 5 m in upper canopy overstory	50 m line intercept in cm measured to nearest 1/10 m, 3 times along each intercept. If there were not three shrubs on intercept, used nearest shrubs to the transect within a 100 m limit.	PSS
DNSN03 – number of snags > 15 cm dbh	Belt transect 8 x 100 m, count total #.	PFO
BAW001 – dbh of trees > 6 m tall	Belt transect 8 x 50 m, use diameter tape on all trees in belt.	PFO
CANPWIN – canopy cover of persistent winter vegetation > 0.5 m tall	50 m transect, 10 plot frames at 5 m intervals. Place length of frame perpendicular to transect. Recorded as an estimate of % coverage of any vegetation that remains standing (even plant skeletons).	F, SSL, SSH, MS, PEM, PSS, PFO
VCVHE01 - % forb canopy (non grass, non woody vegetation)	50 m line intercept in cm measured to nearest 1/10 m, 3 times along each intercept. If there were not three shrubs on intercept, used nearest shrubs to the transect within a 100 m limit. Recorded as an estimate of % coverage of forbs to nearest 5%. If there were any forbs present at least 5% was recorded.	F, G, SSL, SSH, MS, PEM, PSS, PFO
VRCGR01 - % grass canopy cover	50 m line intercept in cm measured to nearest 1/10 m, 3 times along each intercept. If there were not three shrubs on intercept, used nearest shrubs to the transect within a 100 m limit. Recorded as an estimate of % coverage of forbs to nearest 5%. If there were any forbs present at least 5% was recorded.	F, G, SSL, SSH, MS, PEM, PSS, PFO
VCVEM01 - % cover of emergent vegetation	50 m line intercept in cm measured to nearest 1/10 m, 3 times along each intercept. If there were not three shrubs on intercept, used nearest shrubs to the transect within a 100 m limit. Recorded as an estimate of % coverage of forbs to nearest 5%. If there were any forbs present at least 5% was recorded (did not count *Equisetum* spp.).	PEM, PSS, PFO
VHTHE01 – height of herbaceous canopy	50 m transect, measure height in cm using meter stick at the center of each frame (10 plot frames at 5 m intervals).	F, G, SSL, SSH, MS, PEM, PSS, PFO
WDPEM01 – water depth	50 m transect, measure depth in cm using meter stick at the center of each frame (10 frames at 5 m intervals).	PEM, PSS

Table 4 (continued)
Variables from the 1991 Report

Variable	Method Used	Cover Type
GWTHEM – dominant form of emergent vegetation	Visual appraisal on the entire length of transect. Record applicable code (1 = cattail, cordgrass, bull-rush; 2 = bluejoint reedgrass, reed canarygrass, sedge; 3 = button bush; 4 = other or no emergents present).	PEM, PSS
DENSITE – presence/distance of otter denning sites. Den site = hollow logs, tree roots, rock ledges, or abandon beaver, marmot and muskrat burrows, *etc*.	Noted the presence of 1 potential den site within 100 m x 10 m belt transect, which is closest to water. Measure distance from site to permanent water in m. Use codes: 0 – no sites; 1 = present $\leq$ 10 m from shore; 2 = present $\geq$ 75 m from shore.	SHOR75
DSTRCVR – density of stream side cover. Cover = docks, undercut banks, rocks, vegetation other than pasture or grass, log jams, *etc.*	Use codes: 1 = 0%; 2 = 1-20%; 3 = 21-50%; 4 = 51-80%; 5 = $\geq$ 80%. This is a visual estimate of % cover along entire length of belt transect 100 m x 10 m. Recorded 2 estimates, one for each half of transect.	SHOR75
DISTCVR – distance to nearest suitable cover within 75 m from shore (see DSTRCVR for suitable cover)	Measure distance from shore to nearest cover (in m) within a 100 m x 10 m transect. Recorded 2 distances, one for each half of transect. Do not count cover > 75 m from shore.	SHOR75
SDIPS01 – Distance to perch site (perch site = trees, shrubs, fences, boulders, *etc.*, 2-5 m above ground)	50 m transect, at 3 points on transect (0.0 m, 25 m, and 50 m) measure distance to nearest perch site in m.	F, G, SSL, SSH
DISTESC – distance to escape cover (cover = MS, PFO, PSS, SSL, SSH, and UF)	Measure distance (in m) from a random point within each cover type on aerial photo nearest cover.	AC, UF, G, SSL, SSH, MS, PSS, PFO
DISTROC – distance to exposed rock (ER) or rock talus (RT)	Measure distance (in km) from a random point within each cover type on aerial photos to edge of nearest rock cover type.	G, SSH, SSL
DISTMS – distance to mesic shrub (MS)	Measure distance (in km) from a random point within each cover type on aerial photos to edge of nearest MS cover type.	G, SSL, SSH
DSTWFOD – distance to preferred winter food (MS, AC, and UF)	Measure distance (in km) from a random point within each cover type on aerial photos to edge of nearest preferred winter cover type.	UF, SSL, SSH, MS, PEM, PSS, PFO
DISTRST – distance to roost cover (MS, PFO, PSS, and SSH)	Measure distance (in km) from a random point within each cover type on aerial photos to edge of nearest roost cover type.	AC, G, UF, MS, SSL, SSH, PSS, PFO
HUDIST – human disturbance	Record code #s describing amount of human disturbance (1 = none; 2 = occasional; 3 = frequent; 4 = continuous) for a random point along the shore of each POW.	POW
STO01 – topographic class	Record code #s describing terrain (1 = level; 2 = rolling; 3 = ridges and rims; 4 = mountainous) for 1-mile segments by shoreline determined from aerial photography.	G, SSL, SSH
CVSHOR - % shoreline covered with vegetation	Visual approximation from serial photos amount of shoreline covered with vegetation. Recorded for each POW.	POW
ISL1 – nest island suitability	Record code #s describing available nest locations (1 = island and high veg.; 2 = island and moderate veg.; 3 = island and no veg.; 4 = no island or tub) for every river mile	R, LOW
BRHAB – brood rearing habitat	Record code #s describing habitat (1 = pasture and forage present; 2 = pasture and forage limited; 3 = no pasture/forage) for every river mile)	R, LOW

California Quail. Cover types used for assessing California quail include Grassland, Shrub-Steppe Low and High, Annual Forb Grassland, Palustrine Forest, Palustrine Scrub-Shrub, Mesic Shrubland, and Agricultural. Calculations were made using food, escape cover, and winter roost cover Life Requisite Suitability Indexes (LRSI). Assumptions in models were: 1) grass and forb cover types had a shrub height of zero; and 2) shrub-steppe high on the upper pools was the same as lower pools.

Values for distance to escape cover and distance to roost were found in the 1989 database file. These values matched those found in the printout, from USFWS HEP software for lower river, current condition (1989). On the upper pools, current condition, the distance measurements on the printout only match those for the grassland cover type. None of the distance measures for pre-project condition in the 1989 database matched those on the printout. Distance values were inserted from the printout into the current Access database to make the calculations work. The model within the Access database calculated correctly, and was used to calculate HSIs and HUs from the present data set.

Canada Goose. Shore, 100-meter band was the only cover type used to assess Canada goose. Calculations were made by estimating suitable nesting habitat near the shore and the suitability of brood habitat on the shore. This included access to the habitat by broods as high vertical banks are common due to wave action and erosion. Variable numbers calculated from the 1989 database came out the same as the 1991 Report. Suitability Index values were entered directly into the Access database. HU values calculated within the Access database are slightly different due to rounding of numbers in the 1991 report. The model within the Access database was calculating correctly and was used to calculate HSIs and HUs from the present data set.

Chukar Partridge. Cover types used for chukar partridge assessment included Grassland, Shrub-Steppe Low and High cover types. Calculations made using shrub cover, herbaceous cover, shrub height, distance to rock outcrop, distance to mesic shrubland, and topographic class variables. Life requisites are divided between habitat composition and structure for feeding and escape cover (rock, mesic shrub, topography). Variable numbers calculated using the 1989 database numbers matched the 1991 Report in all areas. No shrub-steppe high variables were generated for the upper pools in 1958 or 1989. These figures were obtained from the lower reservoirs for all variables except topographic class. The database used in the 1991 Report did not have measures for distance to mesic shrubland. These figures were obtained from the HEP program printout and entered into the Access database. Topographic class was assumed to be the same for pre- and post-project in the 1991 Report. These topographic classes were also applied to the 2001 evaluation. The individual cover type HSI values calculated in the Access database matched those depicted in the 1991 Report, but there were a few minor discrepancies in the data. The distance to rock values calculated from the Access database were slightly different from the HEP printout (1989). There was also a slight difference in percent shrub cover in shrub-steppe low variables for both 1958 and 1989 data sets. These differences had no effect on the individual or overall HSI values, so the data was left unchanged. The HUs were

calculated for each of the three cover types (grassland, shrub-steppe high and shrub-steppe low) before they were summed together. The overall HSI value was the sum of the HU values for all cover types, divided by the sum of acres of habitat. These values matched the 1991 Report. The HUs were also calculated using the sum of the total habitat acres (including exposed rock, rock talus, and mesic shrubland), multiplied by the overall HSI value. The Access database depicts slightly differing HU values from the 1991 Report. This is probably due to rounding errors in the use of the overall HSI values. The model within the Access database calculated correctly, and was used to calculate HSIs and HUs from the present data set.

Downy Woodpecker. Only Palustrine Forest cover type was used for downy woodpecker; and a straight calculation using the averages of the basal area of trees over 6 meters in height and the number of snags over 15 centimeters diameter breast height (DBH) was utilized. The calculation of HSIs and HUs within the Access database matched the results from the 1991 Report exactly. No assumptions were made. The model within the Access database calculated correctly, and was used to calculate HSIs and HUs from the present data set.

Mallard. Only Palustrine Open Water cover type was used for calculations regarding the mallard. Calculations were made using measurements collected on each mile of the river for human disturbance and estimated cover percent of shoreline by vegetation, or by estimated percent of shoreline covered by vegetation. All four (pre-project lower, upper, both upper and lower river, and current) conditions had average human disturbance values of 2, when this parameter was calculated from the original 1989 database. In the 1991 Report, the upper river, current condition (1989), had a human disturbance value of 1, while the other three areas/times were 2. After review of the field forms, it was found that a page was missing for the Little Goose pool. Without this missing page, the value for current condition (1989) on the upper river was close to 1. When the missing page was found and the data from this page was factored in, the human disturbance value for this reach and time was a 2. The values depicted in the 2001 analyses show all pools in 1958 and 1989 having a human disturbance value of 2. This will not change any HSIs, with the exception of the upper river in 1989. The percent of shoreline vegetative cover in the 1989 database matched what was shown in the 1991 Report.

The only other discrepancy was the calculated average shoreline cover percent for the upper river in 1989. This variable was slightly lower than that recorded in the HEP printout. The field forms were checked and verified to ensure that the data was correctly entered into the database. The value was left unchanged, and this lowered the HSI for the upper river in 1989. The model within the Access database was calculated correctly, and was used to calculate HSIs and HUs from the present data set.

Marsh Wren. Only Palustrine Emergent cover type was used in marsh wren calculations. Calculations were made using the emergent vegetation growth form, percent emergent vegetation cover, mean water depth, and tree/shrub canopy cover (woody cover) variables. The assumption from the HEP software printout was that pre-

project and post-project variables are the same. The HSI calculations for 1958 are based on the 1989 variables, while HSI and HU calculations (current Access database) matched those in the 1991 Report for upper and lower river existing condition (1989). Only a small amount of data was collected on the variables for pre-project condition; and that data did not produce any HSI values, since one or more of the parameters in the 1989 database had no data. The model within the Access database calculated correctly, and was used to calculate HSIs and HUs from the present data set.

Mule Deer. Grassland, Shrub-Steppe Low and High, Annual Forb Grassland, Palustrine Forest, Palustrine Scrub-shrub, and Mesic Shrubland cover types were all used for mule deer. Calculations were made using a canopy of shrub cover less than 1.5 meters in height, canopy cover of deer-preferred shrubs, and percent herbaceous canopy cover variables. The calculated variables and HSIs matched those in the 1991 Report data, except for minor differences in the current condition (1989) palustrine scrub shrub on the upper river and the 1958 lower river forb and grassland variables for shrub canopy and deer-preferred shrub cover percentages. This had no effect on the HSI value, so was left unchanged within the Access database. The overall HSI was calculated by dividing the sum of the HUs by the sum of acres for all cover types. The model within the Access database calculated correctly, and was used to calculate HSIs and HUs from the present data set.

Ring-necked Pheasant – Calculations for ring-necked pheasant utilized Annual Forb Grassland, Shrub-steppe Low and High, Palustrine Emergent, Palustrine Forest, Palustrine Scrub-shrub, Mesic Shrubland, Pasture, and Agricultural Crop cover types. Calculations were made using the reproduction, winter cover, and winter food type LRSI. Assumptions in the models were: 1) in shrub-steppe low, shrub-steppe high, mesic shrubland, palustrine forest, and palustrine scrub-shrub, winter canopy equals shrub cover percentage; 2) in palustrine emergent, winter canopy is equal to herbaceous cover; 3) no distance to winter food was calculated for shrub-steppe high, since it is assumed that this distance is the same as that calculated for shrub-steppe low; and 4) half the total agricultural crop acreage for pre-project condition was used. The assumption for ring-necked pheasant was that half the acreage is in fallow ground (*e.g.*, no food value).

Distance to food variables on the 1989 HEP calculation printouts did not match those calculated in the 1989 database. One problem was that distance variables were not entered for pre-project condition. For this reason, the distance to food variables were entered into the current Access database from the 1989 HEP printout. All vegetative variables that were calculated from the Access database matched those in the 1989 HEP printout except for herbaceous cover and height for current condition (1989) on the upper pools. After examining the database figures, it was deduced that the average from a site on the Little Goose pool was left out of the calculations. When the figures for this site were deleted from the database, the calculations matched the outcome of the HEP printout. The Little Goose site had the highest values for herbaceous cover and

height found on both upper pools. These figures were deleted to keep data consistent with the HEP printout and the 1991 Report results. The model within the Access database calculated correctly, and was used to calculate HSIs and HUs from the present data set.

River Otter. Only Shore, 75-meter band, cover type was used for river otter. Calculations were made using the densite distance from water, distance to cover, and density of shoreline vegetation variables. The calculations for river otter were the most difficult to understand in the 1991 Report, but the distance to suitable cover outcomes in the Access database match the 1991 report for all reaches and time. However, the densite presence and density of shoreline vegetation did not match in all cases.

It was obvious that denning site presence variables were entered into the 1989 database using a scale of 0-2 as per the field data sheets. It was assumed that these data were converted to the model's 1,2,3 scale, where the zero values on the field data sheet were converted to a 3. It is also assumed that these data were averaged prior to entry into the USFWS software. In the Access database, all field data were entered using the 1,2,3 scale so they could be averaged before the final Suitability Index (SI) calculation. Only the upper river pre-project and current condition (1989) matched the 1991 Report results. The difference was between an SI value of 0.1 in the 1991 Report, and a current value of 0.5. The database was checked against the field forms, and no data errors were found. Therefore, these figures were left unchanged.

The density of shoreline vegetation data was entered into the 1989 database using the model's 1,2,3,4,5 scale. It was assumed these were averaged prior to entry into the USFWS software. The data was entered into the Access database using the same format, so they could be averaged before the final SI calculation. The Access database result only matched the upper river pre-project condition within the 1991 Report. The other three groups (lower river; pre-project; and lower and upper river, 1989), which had a shoreline vegetation variable average of 4 in the 1989 database, were given a value of 5 in the 1991 report. This is an SI difference between 0.7 (value 4) and 1 (value 5). Since the data looked to be entered correctly, these figures were left untouched.

The result of these differences gave higher HSI values to all reaches and times in the 1991 Report, except for the pre-project upper river. It is unclear why these discrepancies exist. There may have been an agreement among the researchers to change the value of these parameters, but no documentation has been found. These changes raised the baseline for river otter by over 1200 HUs on the lower river. Without further documentation, it is felt these changes are accurate and should be incorporated. The model within the Access database calculated correctly, and was used to calculate HSIs and HUs from the present data set.

Song Sparrow. The Palustrine Forest and Mesic Shrubland cover types were used to calculate values for the song sparrow. The calculation was accomplished using percent canopy cover of shrubs less than 6 meters in height, shrub height under 5 meters, and distance to water. The first assumption (made through random measurements) was

that distance to water was equal to or less than 400 meters in all areas. This was mainly because the river or some other water source (guzzler, spring, *etc.*) was always nearby. The Access database calculations of HSIs and HUs matched the results in the 1991 Report. The 1989 distance to water variables were also applied to the present evaluation (2001). The model within the Access database calculated correctly, and was used to calculate HSIs and HUs from the present data set.

Western Meadowlark. Grassland, Shrub-steppe Low and High, and Annual Forb Grassland cover types were all used for western meadowlark. Calculations were made using the measures of herbaceous canopy, percent grass cover, mean herbaceous vegetation height, distance to perch site, and canopy cover of shrubs less than 6 meters in height. All variable calculations (current Access database) matched those in the 1991 Report. The HSI values were transposed between upper river shrub-steppe low and shrub-steppe high for current condition (1989), and lower river shrub-steppe low and shrub-steppe high for pre-project condition in the 1991 Report. These figures were left unchanged in the outcome of the Access database. The model within the Access database calculated correctly, and was used to calculate HSIs and HUs from the present data set.

Yellow Warbler. Only Palustrine Scrub-shrub cover type was used for the yellow warbler. The calculation was accomplished using percent deciduous tree and shrub cover, percent hydrophytic shrub cover (willows, cottonwoods, *etc.*), and the height of shrubs less than 5 meters. The percent shrub canopy cover and mean shrub height parameters calculated in the Access database matched the 1991 Report results. Percent of hydrophytic vegetation in the canopy variable (percent hydrophytic cover divided by percent deciduous cover, multiplied by 100) only matched the upper river pre-project condition. The error seems to be with the calculated actual percent hydrophytic vegetation, since the calculated percent deciduous cover matched those values in the 1991 Report for all reaches and times. The field values were recalculated for the 1958 lower river and the 1989 upper and lower river for canopy cover of hydrophytic shrubs from the field forms and they matched the values in the 1989 database. The value for percent of hydrophytic vegetation in the canopy variable for the 1989 upper river is very close to the HEP printout (USFWS software) value for 1958 lower river. The value for the 1989 lower river is only a couple of percentage points higher than the HEP printout value, and it is unclear why a difference exists. These values may have been calculated slightly differently, or there may have been errors in HEP software calculation. This may explain the slight difference in the 1989 lower river figure. It is also suspected that the hydrophytic vegetation in the canopy variable from the 1989 upper river may have been transposed with the 1958 lower river as data was entered into the USFWS HEP software. This would have only slightly reduced the lower river pre-project condition, while slightly increasing the upper river existing condition (1989). The highest value for average shrub height in the 1989 upper river dataset was dropped to make it equal to the 1989 HEP printout. Otherwise, the outcome was left as it was calculated from the 1989 database. The result shows a slightly higher HSI value for the 1989 upper river and the 1958 lower river, when compared to the original 1989 HEP printouts. Tests of the model within the Access database were done to ensure it

was calculating correctly. The Access database was used to calculate HSIs and HUs for the present data set.

3.4 The XYZ Lands

The HEP data for these lands were collected in the early to mid 1990s. Initial estimates were made using the baseline sample sites of the 1989 lower Snake River evaluation. These figures were then "ground truthed" by USFWS and published in the 1995 report, *Final Report for the HSI Validation Study for the Lower Snake River Wildlife Compensation Plan* (USFWS, 1995). The baseline figures for the HSI values of the XYZ lands were derived from this report. Some XYZ parcels were not included in the USFWS report, however. These lands include Burma Public Fishing Access (PFA), McDonald Bridge PFA, Swegle PFA, Mill Creek Habitat Management Unit (HMU) and Wallula HMU. The HSI data for these parcels were derived from 1989 through 1995. It is assumed these data were collected using the measured HEP technique, in whole or in part. Since no documentation accompanied these data, HSI figures for these sites are considered estimates.

Baseline cover type acreage figures for the XYZ lands were derived from delineations made on uncontrolled aerial photography for each individual site. The dates of photography range from 1991 to 1995, depending on the site. No geo-correction was done to account for aerial photo warp and skew. This would impact the sites having steep topography. The 2002 mapping began with these delineations from the photography described above. These were redelineated within ArcView GIS onto 1996 to 1998 black and white orthophotography. Some of the polygons were updated due to changes depicted on the orthophotography. This was the basis for the 1995 acreage.

3.5 The HEP Credits

The HEP crediting was discussed in the 1991 Report. All lands on the lower Snake River were given full HEP values. The XYZ lands were given only 50 percent of the existing HU value for each species. If the XYZ lands were developed for additional HEP credit, then the developed acres were given full HEP credit. Bailie Ranch, which is under lease by WDFW, receives no HEP credit for existing habitat value, 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, these acres will be given full HEP credit.

The values calculated for this report will use a flat 50-percent value for HU calculation on all XYZ lands except for Bailie Ranch, since the values generated from any developments were small in comparison to the entire site. The measured HSI and cover type acreage differences, even at 50 percent, generated the majority of the gains or losses depicted in this report. If improvements were based on a straight acreage change, HU values would be artificially inflated. Bailie Ranch values were calculated on acreage changes within the mesic shrub, annual forb grassland, palustrine scrub shrub, palustrine forest, and agricultural crop cover types. Although mesic shrub

developments have been realized, most of these changes were due to more accurate cover type mapping and land use changes.

4.0 The 2001-2002 Dataset

4.1 Cover Types

4.1.1 Lower Snake River

The 2001 lower Snake River cover types were based on cover type updates performed in 1996 by USFWS (USFWS, 1997). The USFWS reviewed and updated the cover type mapping from the 1991 Report (depicted on the 1987 aerial photography). The updates were drawn on mylar covering 1995 uncontrolled aerial photography of the lower Snake River. These updates were then transferred to the GIS dataset of the 1989 cover types, and saved as a new cover type layer. A more recent update of cover types was not performed due to costs and time to generate new photography, re-delineate cover types in the GIS, and field check sites. Some updates were performed if gross errors were found in the cover type mapping. The cover type acres were then calculated from the updated cover type layer. Acreages for POW, Shore 75, and Shore 100 were carried over from the 1989 dataset to maintain consistency, because it was assumed that these areas would remain unchanged.

The new cover type acres will depict a slightly different figure for total acres, mainly due to the way the acres were compiled. The difference is about 100 more acres on the lower river in 2001, as compared to 1958. This equates to about 2 percent of the total study area of the lower Snake River. The upper river acres were fairly consistent. The acres per individual cover type have changed from 1987 to 1995.

4.1.2 The XYZ Lands

The XYZ lands had cover types mapped over black and white orthophotoquads, based on delineations performed in the mid-1990s on uncontrolled color aerial photography from the same period. For the 2002 acreages, cover type polygons were adjusted using uncontrolled color photography shot in spring 2002. The 2002 cover types of the steeper XYZ lands (Pintler, Nisqually John, Shumaker, Campbell, Hartsock, Revere, and Fisher Gulch) were mapped using digital color orthophotography. There were no definitive boundaries for the individual units. Boundaries were determined using the location maps in the letter supplements (Corps, 1994; 1995; 2001). The total acreage of each site did not match what was designated in the real estate description in all cases. If the 2002 mapping was only slightly less than the 1995 totals, the difference was not questioned. In some instances, the 2002 acreage was greater than that of 1995. If the site was small, the area was scrutinized to find boundary errors. If no obvious boundary errors were found on the larger sites, the mapping was left unchanged. Rice and Willow Bar had grassland acreages reduced until they equaled the 1995 totals. With these differences, the 2002 XYZ lands acreage was almost 340 less than those depicted for 1995. The figures depicted in Table 1 are the results of the

2002 effort. Acreage breakdown is found in Appendix A. Plates of the cover type mapping for all sites are found in Appendix B.

4.2 Field Data Collection

4.2.1 Lower Snake River

Measured HEP field data was collected at randomly selected cover type polygons for each of the four lower Snake River reservoirs. The data collection followed the 1991 Report protocol as closely as possible. Field data was collected between May and August 2001. The timing of this field collection was about a month later than the field data collected in 1989. To help ensure herbaceous measures were done during the growing season, these polygons (grassland, forbland, shrub steppe low and high) were sampled before any of the shrub and tree polygons (palustrine scrub shrub/forest, mesic shrubland).

4.2.2 The XYZ Lands

Field data were collected for the XYZ lands from April to August 2002. Field data was not collected from several other sites, including Burma and Swank PFAs, Kelly Bar, Willow Bar and Rice Bar HMUs. Kelly Bar field variables were duplicates of data collected for Nisqually John HMU. Burma PFA field variables were copied from Whitstran PFA field data. Swank data was copied from Shumaker data. Rice Bar was copied from lower Snake River field transects collected at Rice Bar and adjacent sites in 2001. Willow Bar data was generated in the same manner as Rice Bar.

4.3 Database Entries and Adjustments

The 2002 dataset was entered from the data sheets line by line. Some manipulations were necessary to maintain consistency with the older dataset, as well as to compensate for data conversion. In the original database (1989), all shrub cover variables were entered as cover percentages. These were converted to centimeters, since this is how the data is entered on the field sheets. The distance variables were also converted from meters to kilometers, where needed, to maintain consistency. These changes have had no effect on the calculations. Not all of the 1989 data file was checked against the original field data sheets, since many of the calculations matched the final HSI and HU figures depicted in the 1991 Report. The percent grass cover variable (within all herbaceous vegetation) was calculated and reinserted into the database for all cover types in the 2002 dataset. As mentioned before, the 1989 dataset was manipulated with regard to shrub cover and distance variables. There were also some minor data manipulations/corrections made in the 1989 dataset to try and match the outcome in the 1991 Report as closely as possible. Some special

manipulations were needed due to differing datasets. The 1989 data was already compiled by sample site, where the 2001 to 2002 data was not compiled. Data compilation by site was needed before averages were calculated.

The distance variables were calculated a little differently than in 1989. In 1989, random polygons were chosen within each pool and distance measures were made directly from orthophoto quads. Five distance variables were used: Distance to rock outcrop, mesic shrubland, escape cover, roost cover, and winter food. In 2001-2002, distances were derived through GIS analysis, using ArcView software. These procedures are explained in detail in Appendix C. Basically, for each measure, each polygon of the base cover types for the species models had distances calculated to the nearest cover/food cover type. The 2001 measures were averaged by pool, and then by upper and lower river segments. The 2002 measures were averaged by site, from polygon centroid to polygon centroid. This means there were no zero values unless the two adjacent polygons were the same cover type. The averages of the upper and lower pool distance measures were inserted into the main Access database for HSI and HU calculations.

In 1989, variables were calculated using Database III+ software and other tools. These variables were then entered into the USFWS HEP software to calculate HSI and HU values. The 2001 to 2002 analysis used an Access database and queries to calculate HEP values for all years (1958, 1989, 2001, and 2002). The model equations used for each species analyzed were inserted in the appropriate queries for HSI and HU calculations. These equations can be found in Appendix D. This process eliminated as many intermediate steps as possible from data collection to producing reports on results. This also assures that field data is kept as a part of the database, if future reference is needed. All HSIs and subsequent HUs were derived from measured HEP field data except for the 1995 XYZ lands. These HU values were derived from predetermined HSIs for each species, cover type, and site (Corps, 2000).

Since much of the 2002 cover type updates for the XYZ lands were completed after the field data was collected, this created a situation where some sites had cover types that were not measured by the field crews because they were not delineated on the field maps. This happened if new cover types were added to the site during the mapping process. If this occurred, field data were copied from sites in close proximity or having similar characteristics as the site in need of data. Nisqually John and Kelly Bar HMUs, and Couse Creek PFA needed data for shrub steppe low. This data was obtained from field transects at Wilma, Moses, and north shore river mile 132, which were collected in 2001. Henley HMU needed data for the developed shrub plots, and this was obtained from data collected at Wallula HMU. Sulphur Creek needed data for shrub steppe low, palustrine scrub shrub and palustrine emergent cover types; and this data was copied from Whitstran PFA. Swegle PFA needed data for palustrine emergent, and Mill Creek HMU needed annual forb grassland data. These data were copied from Hartsock Habitat Management Area (HMA) and Wallula HMU, respectively. Pintler Creek and Hartsock HMAs copied annual forb grassland data from Campbell HMA. Hartsock also copied palustrine scrub shrub data from field transects collected at Dry Gulch (along the

Snake River) in 2001. Campbell HMA copied data for shrub steppe high from Pintler Creek HMA. Fisher Gulch, Shumaker, and Couse Creek copied palustrine scrub shrub data collected in 2001 from the south shore of the Snake River, at River Mile 120. Naches PFA copied annual forb grassland from Sulphur Creek PFA and mesic shrubland data from Swegle PFA. Donald Road PFA copied annual forb grassland data from Ferry Road PFA and palustrine emergent data from Whitstran. Ferry Road PFA copied shrub steppe low data from Whitstran and palustrine forest data from Donald Road. Whitstran PFA, Revere Ranch HMA, and Wallula HMU copied data for shrub steppe high from Windmill HMA. Wallula HMU also copied data for palustrine forest and palustrine scrub shrub from McDonald Bridge PFA.

5.0 Results

The basic results of this investigation are depicted in Tables 5, 6 and 7. Table 5 shows the credit derived from the lower Snake River Corps lands. Table 6 shows credits derived from the XYZ lands, and Table 7 shows the overall credit derived from both lower Snake River and XYZ lands. These tables represent the gross results. A breakdown of calculations, by species model with some data details, is shown in Appendix E. The expanded results of the XYZ lands are shown in Appendix F. For the lower Snake River, it is evident there have been gains since 1989 for all species except mallard. The XYZ lands show only about half the species showing gains since 1995. The overall balance, as depicted in Table 7, still shows an HU deficit for California quail, Canada goose, downy woodpecker, mallard, ring-necked pheasant, and yellow warbler. The other six species exhibit HU surpluses as compared to the 1958 base condition. The following results per species were derived from information in Appendices A and D. Some projections of XYZ lands were made in 1995 by the Corps and USFWS personnel. Projections were based on available acreage and HSI potential that would be derived through management and proposed developments. Not all species per site had projected improvements. These projections were compared to the actual results where data was available. These projections are not presented formally, since they are basically estimates and used for discussion purposes only.

Table 5
Comp Plan Lower Snake River Lands HEP Credit 2001
(Four Reservoirs and Lands)

Species	1958 Acres	Base HUs (1958)	1989 Acres	1989 HUs	2001 Acres	2001 HUs	Current HU Balance
California Quail	28751.50	28024.81	17482.69	6008.28	17624.80	11044.79	-16980.02
Canada Goose	12183.70	3896.12	11351.90	1768.97	11351.90	2663.19	-1232.92
Chukar	24866.60	9916.03	18223.19	7288.28	18438.99	7736.50	-2179.54
Downy Woodpecker	710.80	710.80	230.00	73.43	443.20	184.49	-526.31
Mallard	293.70	89.48	504.70	95.43	504.70	55.25	-34.24
Marsh Wren	9.90	1.10	116.00	28.22	363.80	86.85	85.76
Mule Deer	26133.30	8180.37	17275.19	6022.58	17513.80	5676.03	-2504.33
Ring-Necked Pheasant	18836.90	8045.00	7901.09	3163.05	8617.40	4442.99	-3602.01
River Otter	9398.70	4246.83	8566.90	4531.35	8566.90	7427.55	3180.71
Song Sparrow	1548.10	1516.67	842.00	796.41	1192.20	1145.09	-371.58
Western Meadowlark	22848.60	7879.20	16065.19	6688.71	15724.50	6639.00	-1240.19
Yellow Warbler	1736.60	1136.91	368.00	263.23	597.10	503.91	-632.99

Table 6
LSR Comp Plan XYZ Lands HEP Credit 2002

Species	Base	Base Acres	Base Credited HUs	Current Year	Current Acres	Current Credit HUs
California Quail	1995	22180.90	1193.82	2002	22079.80	4574.75
Canada Goose	1995	1.00	0.00	2002	190.70	18.01
Chukar	1995	21553.00	4723.88	2002	21651.25	7248.80
Downy Woodpecker	1995	464.90	160.03	2002	420.00	120.98
Mallard	1995	112.00	5.87	2002	167.10	14.00
Marsh Wren	1995	99.90	6.97	2002	221.20	22.66
Mule Deer	1995	21196.10	2536.67	2002	21204.50	2993.34
Ring-Necked Pheasant	1995	9862.10	1188.59	2002	9725.25	1335.34
River Otter	1995	126.70	30.39	2002	107.00	34.39
Song Sparrow	1995	1265.80	482.10	2002	1571.20	714.39
Western Meadowlark	1995	19870.30	2419.06	2002	19470.55	3840.18
Yellow Warbler	1995	60.00	21.06	2002	162.75	83.48

Table 7
All LSR Comp Plan Lands HEP Balance 2002

Species	Base HUs	2001 Lower Snake River Lands HUs	2002 XYZ Lands HUs	Current HU Balance
California Quail	28024.81	11044.79	4574.75	-12405.27
Canada Goose	3896.12	2663.19	18.01	-1214.92
Chukar	9916.03	7736.50	7248.80	5069.26
Downy Woodpecker	710.80	184.49	120.98	-405.33
Mallard	89.48	55.25	14.00	-20.24
Marsh Wren	1.10	86.85	22.66	108.42
Mule Deer	8180.37	5676.03	2993.34	489.01
Ring-Necked Pheasant	8045.00	4442.99	1335.34	-2266.67
River Otter	4246.83	7427.55	34.39	3215.10
Song Sparrow	1516.67	1145.09	714.39	342.81
Western Meadowlark	7879.20	6639.00	3840.18	2599.99
Yellow Warbler	1136.91	503.91	83.48	-549.52

5.1 California Quail

Upper Pools, Lower Snake River

The 2001 results show a total of 5312 HUs, with an overall HIS value of 0.58 applied to 9202 acres. The HIS values in 1989 and 1958 were 0.52 and 0.95, respectively. The 2001 acreage is almost 380 greater than in 1989. The resulting HUs in 2001 were 750 more than in 1989. This is still about 7400 less than what was calculated in 1958.

Lower Pools, Lower Snake River	The 2001 results show a total of 5733 HUs, with an overall HSI value of 0.68 applied to 8423 acres. The HSI values in 1989 and 1958 were 0.17 and 1.0, respectively. The 2001 acreage is almost 225 acres less than in 1989. The resulting HUs in 2001 were 4300 more than in 1989. This is still about 9000 less than what was calculated in 1958. The increase in HSI between 1989 and 2001 is reflected in an increase in food, cover, and roost LRSIs.
Bailie Ranch	The 2002 results show a total of 1689.8 HUs, with an overall HSI value of 0.48 applied to 3507 acres. When initial analysis of Bailie Ranch was done in 1995, no value was given to the existing habitat. The 2002 acreage is about 59 acres less than in 1995. The credit value is 136.4 HUs. This is based on the positive change in acreage for California quail cover types between 1995 and 2002. Most of these gains were in Crop, which increased from zero to 202 acres.
Benton City	The 2002 results show a total of 16.8 HUs, with an overall HSI value of 1.0 applied to 16.8 acres. The HSI value in 1995 was also 1. The 2002 acreage is 16.8, which is slightly higher than in 1995. The credit value is 8.4 HUs. This is based on the 50 percent credit on existing habitat. This is slightly more than in 1995, which exceeds the projected HU figure of 8.2.
Burma	The 2002 results show a total of 0.6 HUs, with an overall HSI value of 1.0 applied to 0.6 acres. The HSI value in 1995 was also 1. The 2002 acreage is 2.5 acres less than in 1995. This is due to the inability to determine the exact boundaries of the site. The maps and information in the letter supplement give little detail as to the real boundary of this PFA. The 2002 total acreage was much less than reported in 1995. Since the acres are less and no other corroborative data could be found, the data were left alone. The credit value is 0.3 HUs. This is based on the 50 percent credit on existing habitat. This is almost 3 HU's less than in 1995.

Campbell	The 2002 results show a total of 205.6 HUs, with an overall HSI value of 0.27 applied to 529 acres. The HSI value in 1995 was 0.39. The 2002 acreage is 32 acres more than in 1995. The credit value is 102.8 HUs. This is based on the 50 percent credit on existing habitat. This is slightly less than in 1995.
Central Ferry	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 286.2 acres. The HSI value in 1995 was also zero. The 2002 acreage is about 184 acres more than in 1995. This is mainly because of the conversion of pasture to grassland.
Couse Creek	The 2002 results show a total of 2.3 HUs, with an overall HSI value of 1.0 applied to 2.3 acres. The HSI value in 1995 was also 1. The 2002 acreage is slightly less than in 1995. The credit value is 1.2 HUs. This is based on the 50 percent credit on existing habitat. This is slightly less than in 1995, which is slightly less than the projected HU figure of 2.
Donald Road	The 2002 results show a total of 71 HUs, with an overall HSI value of 1.0 applied to 71 acres. The HSI value in 1995 was also 1.0. The 2002 acreage is about 6 more than in 1995. This is primarily due to increases of mesic shrub, palustrine forest, and scrub shrub habitats. The credit value is 35.5 HUs. This is based on the 50 percent credit on existing habitat. This is 3 more than in 1995.
Ferry Road	The 2002 results show a total of 59.2 HUs, with an overall HSI value of 0.91 applied to 64.8 acres. The HSI value in 1995 was 0.03. The 2002 acreage is about 22 acres higher than in 1995. The change is primarily due to a shift from pasture to crop. Other gains were made in annual forb grassland, and shrub steppe low with losses in grassland. The credit value is 29.6 HUs. This is based on the 50 percent credit on existing habitat. This is 29 more than in 1995.

Fisher Gulch	The 2002 results show a total of 275 HUs, with an overall HSI value of 0.19 applied to 1418.5 acres. The HSI value in 1995 was 0.12. The 2002 acreage is about 174 acres less than in 1995. A large part of this difference was in how exposed rock was mapped in 2002. There were 127 more acres of exposed rock in 2002 with a subsequent loss of grassland. There were also 40 acres more total terrestrial habitat in 1995 as compared to 2002. Boundaries were checked against the mapped boundaries within the letter report. The difference is probably due to mapping methods. The credit value is 137.5 HUs. This is based on the 50 percent credit on existing habitat. This is 42 more than in 1995.
Hartsock	The 2002 results show a total of 697.5 HUs, with an overall HSI value of 0.29 applied to 2442 acres. The HSI value in 1995 was 0.2. The 2002 acreage is slightly more than in 1995. The credit value is 348.8 HUs. This is based on the 50 percent credit on existing habitat. This is 105 more than in 1995, which is slightly less than the projected HU figure of 249.5.
John Henley	The 2002 results show a total of 18.7 HUs, with an overall HSI value of 0.03 applied to 692.7 acres. The HSI value in 1995 was 0.01. The 2002 acreage is 182 acres more than in 1995. This is mainly attributed to the conversion of pasture to grassland. The credit value is 9.35 HUs. This is based on the 50 percent credit on existing habitat. This is almost 7 more than in 1995, which is about 240 less than the projected HU figure of 251.

Kelly Bar	The 2002 results show a total of 153.2 HUs, with an overall HSI value of 0.93 applied to 165.3 acres. The HSI value in 1995 was 0.04. The large difference in HSI values is attributed to the fact that Food LRSI values were much lower in 1995. Kelly Bar field data was derived from Nisqually John HMU. These sites are fairly close in proximity though on opposite sides of the river. Habitat values should be similar. This is reflected in the fact that Nisqually John has a relatively high HSI value for Quail (1.0). The only difference is the distance values calculated for each site and relative habitat percentages. The 2002 acreage is 65 acres less than in 1995. This is mainly attributed to how exposed rock was mapped. There were about 56 more acres of exposed rock in 2002 as compared to 1995. The other acres were attributed lower total acres found in 2002 as compared to 1995. The credit value is 76.6 HUs. This is based on the 50 percent credit on existing habitat. This is 72 more than in 1995, which exceeds the projected HU figure of 21.
McDonald Bridge	The 2002 results show a total of 110 HUs, with an overall HSI value of 1.0 applied to 110 acres. The HSI value in 1995 was also 1. The 2002 acreage is slightly less than in 1995. The credit value is 55 HUs. This is based on the 50 percent credit on existing habitat. This is about 3 less than in 1995.
Mill Creek	The 2002 results show a total of 12.6 HUs, with an overall HSI value of 0.2 applied to 61.8 acres. The HSI value in 1995 was zero. The 2002 acreage is slightly less than in 1995. The credit value is 6.3 HUs. This is based on the 50 percent credit on existing habitat. This is 6.3 more than in 1995, which is about 57 less than the projected HU figure of 63.
Naches	The 2002 results show a total of 6.6 HUs, with an overall HSI value of 1.0 applied to 6.6 acres. The HSI value in 1995 was 0.64. The 2002 acreage is slightly higher than in 1995. The credit value is 3.3 HUs. This is based on the 50 percent credit on existing habitat. This is 1.2 more than in 1995.

Nisqually John	The 2002 results show a total of 2490 HUs, with an overall HSI value of 1.0 applied to 2490 acres. The HSI value in 1995 was 0.76. The 2002 acreage is about 125 acres less than in 1995. A large part of this difference was in how exposed rock was mapped in 2002. There were 117 more acres of exposed rock in 2002 with a subsequent loss of grassland. The credit value is 1245 HUs. This is based on the 50 percent credit on existing habitat. This is 250 more than in 1995, which exceeds the projected HU figure of 1042. The overall HSI increase was because of increases in food and escape cover EOAs (Equivalent Optimum Areas). It is difficult to compare figures more than this since the 1995 data only gives the LRSIs.
Pintler	The 2002 results show a total of 1357.5 HUs, with an overall HSI value of 0.33 applied to 4133 acres. The HSI value in 1995 was 0.03. The 2002 acreage is about 80 acres less than in 1995. A large part of this difference was in how exposed rock was mapped in 2002. There were 74 more acres of exposed rock in 2002 with a subsequent loss of grassland. The credit value is 678.7 HUs. This is based on the 50 percent credit on existing habitat. This is 607 more than in 1995, which exceeds the projected HU figure of 601. The overall HSI increase was because of increases in food, escape and winter cover EOAs (Equivalent Optimum Areas). It is difficult to compare figures more than this since the 1995 data only gives the LRSIs.
Revere Ranch	The 2002 results show a total of 593.3 HUs, with an overall HSI value of 0.29 applied to 2059.3 acres. The HSI value in 1995 was 0.02. The 2002 acreage is about 180 acres less than in 1995. A large part of this difference was in how exposed rock was mapped in 2002. There were 182 more acres of exposed rock in 2002 with a subsequent loss of grassland. The credit value is 296.7 HUs. This is based on the 50 percent credit on existing habitat. This is 274 more than in 1995, which is about 123 less than the projected HU figure of 425. The overall HSI increase was because of increases in food, escape and winter cover EOAs (Equivalent Optimum Areas). The food EOA was the most improved. It is difficult to compare figures more than this since the 1995 data only gives the LRSIs.

Rice Bar	The 2002 results show a total of 11.2 HUs, with an overall HSI value of 0.05 applied to 222 acres. The HSI value in 1995 was 0.16. The 2002 acreage is a little higher than in 1995. The credit value is 5.6 HUs. This is based on the 50 percent credit on existing habitat. This is 11.5 less than in 1995, which is about 221 less than the projected HU figure of 227.
Shumaker	The 2002 results show a total of 1536.6 HUs, with an overall HSI value of 0.8 applied to 1932.3 acres. The HSI value in 1995 was 0.18. The 2002 acreage is a little lower than in 1995. The credit value is 768.3 HUs. This is based on the 50 percent credit on existing habitat. This is 596 more than in 1995. The overall HSI increase was because of huge increases in food, and escape cover EOAs (Equivalent Optimum Areas). It is difficult to compare figures more than this since the 1995 data only gives the LRSIs.
Sulphur Creek	The 2002 results show a total of 50.3 HUs, with an overall HSI value of 0.57 applied to 88.3 acres. The HSI value in 1995 was 0.08. The 2002 acreage is a little lower than in 1995. The credit value is 25.2 HUs. This is based on the 50 percent credit on existing habitat. This is 21.6 more than in 1995. The overall HSI increase was because of increases in food, escape and winter cover EOAs (Equivalent Optimum Areas). The escape cover EOA was the most improved. It is difficult to compare figures more than this since the 1995 data only gives the LRSIs.
Swank	The 2002 results show a total of 11.8 HUs, with an overall HSI value of 0.6 applied to 19.5 acres. The HSI value in 1995 was 0.56. The 2002 acreage is about 5 acres less than in 1995. This is mainly due to the total acreage difference between 1995 and 2002. Since the 2002 acreage is lower the figures were left alone. The credit value is 5.9 HUs. This is based on the 50 percent credit on existing habitat. This is 1.3 less than in 1995.
Swegle	The 2002 results show a total of 83.6 HUs, with an overall HSI value of 1.0 applied to 83.6 acres. The HSI value in 1995 was also 1. The 2002 acreage is a little higher than in 1995. The credit value is 41.8 HUs. This is based on the 50 percent credit on existing habitat. This is 2 more than in 1995.

Wallula HMU	The 2002 results show a total of 171.4 HUs, with an overall HSI value of 0.94 applied to 181.7 acres. The HSI value in 1995 was 0.48. The 2002 acreage is much higher than in 1995. This is mainly due to the conversion of pasture to grass, food plots and shrub and tree plots. The credit value is 85.7 HUs. This is based on the 50 percent credit on existing habitat. This is 80 more than in 1995, which is about 108 less than the projected HU figure of 194.
Whitstran	The 2002 results show a total of 16 HUs, with an overall HSI value of 1.0 applied to 16 acres. The HSI value in 1995 was also 1. The 2002 acreage is about 4.5 acres lower than in 1995. This is mainly due to the total acreage difference between 1995 and 2002. Since the 2002 acreage is lower the figures were left alone. The credit value is 8 HUs. This is based on the 50 percent credit on existing habitat. This is 2.4 less than in 1995.
Willow Bar	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 40.5 acres. The HSI value in 1995 was zero. The 2002 acreage is the same as in 1995. The credit value is zero HUs. This is based on the 50 percent credit on existing habitat. This is the same as in 1995. The projected HU goal for this species is 9.2. With shrub development as planned, this goal should be attainable for this site.
Windmill Ranch	The 2002 results show a total of 926 HUs, with an overall HSI value of 0.64 applied to 1438 acres. The HSI value in 1995 was 0.13. The 2002 acreage is a little lower than in 1995. The credit value is 463 HUs. This is based on the 50 percent credit on existing habitat. This is 373 more than in 1995, which exceeds the projected HU figure of 194. The overall HSI increase was because of increases in escape and winter cover EOAs (Equivalent Optimum Areas). The winter cover EOA was the most improved. It is difficult to compare figures more than this since the 1995 data only gives the LRSIs.

5.2 Canada Goose

Upper Pools, Lower Snake River	The 2001 results show a total of 1649.5 HUs, with an overall HSI value of 0.26 applied to 6369 acres. The HSI values in 1989 and 1958 were 0.12 and 0.29, respectively. The acreage in 2001 is the same as in 1989. The 1989 shore100 acreage was carried over to 2001 since this would remain unchanged. The resulting HUs in 2001 were over 900 more than in 1989. This is still about 250 less than what was calculated in 1958. The increase in HSI between 1989 and 2001 is reflected in an increase in nesting habitat.
Lower Pools, Lower Snake River	The 2001 results show a total of 1013.7 HUs, with an overall HSI value of 0.2 applied to 4983 acres. The HSI values in 1989 and 1958 were 0.21 and 0.35, respectively. The acreage in 2001 is the same as in 1989. The 1989 shore100 acreage was carried over to 2001 since this would remain unchanged. The resulting HUs in 2001 were slightly less than in 1989. This is about 978 less than what was calculated in 1958.
Bailie Ranch	The 2002 results show a total of 4.5 HUs, with an overall HSI value of 0.3 applied to 14.5 acres. When initial analysis of Bailie Ranch was done in 1995, no value was given to the existing habitat. The 2002 acreage is about 14.5 acres more than in 1995. This is primarily seen in the improvement of shoreline habitat around one of the lakes and addition of nesting tubs. The credit value is 4.5 HUs. This is based on the positive change in acreage for Canada goose cover types between 1995 and 2002.
Benton City	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 11.5 acres. The HSI value in 1995 was zero. The 2002 acreage is 11.5 higher than in 1995. This increase was due to the presence of a suitable nesting island offshore in 2002. The shoreline cover is too dense to provide broods access to the inland grasslands. Habitat value remains unchanged between 1995 and 2002.
Burma	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.

Campbell	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Central Ferry	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Couse Creek	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Donald Road	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Ferry Road	The 2002 results show a total of 16.8 HUs, with an overall HSI value of 1.0 applied to 16.8 acres. The HSI value in 1995 was zero. The 2002 acreage is 16.8 higher than in 1995. This site has high quality nesting islands just down stream. The shoreline has some access problems due to the steep bank along the river. Annual forbs and grasses are the dominant cover in the vicinity of the shore. The pasture is further back but provides good late season food. The credit value is 8.4 HUs. This is based on the 50 percent credit on existing habitat. This is 8.4 more than in 1995.
Fisher Gulch	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Hartsock	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
John Henley	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Kelly Bar	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.

McDonald Bridge	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Mill Creek	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Naches	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 2 acres. The HSI value in 1995 was zero. The 2002 acreage is 2 higher than in 1995. This increase was due to the presence of a suitable nesting island offshore in 2002. The shoreline cover is too dense to provide broods access to the inland grasslands. Habitat value remains unchanged between 1995 and 2002.
Nisqually John	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Pintler	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Revere Ranch	The 2002 results show a total of 1.0 HU, with an overall HSI value of 1.0 applied to one acre. The HSI value in 1995 was zero. The 2002 acreage is the same as in 1995. The credit value is 0.5 HUs. This is based on the 50 percent credit on existing habitat. This is 0.5 more than in 1995.
Rice Bar	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Shumaker	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.

Sulphur Creek	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 9.2 acres. The HSI value in 1995 was zero. The 2002 acreage is 9.2 higher than in 1995. This increase was due to the presence of a suitable nesting island in Giffin Lake in 2002. The shoreline cover is too dense to provide broods access to the inland grasslands. Habitat value remains unchanged between 1995 and 2002. The projected HU figure for this species is 2.8. It is unlikely this will be attained at this site.
Swank	The 2002 results show a total of 9.5 HUs, with an overall HSI value of 0.3 applied to 31.7 acres. The HSI value in 1995 was zero. The 2002 acreage is 31.7 higher than in 1995. The credit value is 4.8 HUs. This is based on the 50 percent credit on existing habitat. This is 4.8 more than in 1995.
Swegle	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Wallula HMU	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Whitstran	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Willow Bar	No nesting habitat for Canada goose is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Windmill Ranch	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 104 acres. The HSI value in 1995 was zero. The 2002 acreage is 104 higher than in 1995. This increase was due to the inclusion of the large lake in the northwest area as potential habitat in 2002. Habitat value remains unchanged between 1995 and 2002. The projected HU goal for this species was 8.9. With the development of nesting structures for geese, this goal is attainable at this site.

5.3 Chukar

Upper Pools, Lower Snake River	The 2001 results show a total of 7662 HUs, with an overall HSI value of 0.8 applied to 9579 acres. The HSI values in 1989 and 1958 were also 0.8. The acreage in 2001 is about 430 higher than in 1989. This is mainly reflected by increases in mesic shrub, and shrub-steppe cover types. The resulting HUs in 2001 were about 460 higher than in 1989. This is still about 2300 less than what was calculated in 1958.
Lower Pools, Lower Snake River	The 2001 results show a total of 74.2 HUs, with an overall HSI value of 0.01 applied to 8860 acres. The HSI values in 1989 and 1958 were 0.01 and zero respectively. The acreage in 2001 is about 220 less than in 1989. This is mainly reflected by lower acres in the grassland shrub steppe high cover types. The resulting HUs in 2001 were about 13 HUs less than in 1989. This is still about 74.2 more than what was calculated in 1958.
Bailie Ranch	The 2002 results show a total of 499.4 HUs, with an overall HSI value of 0.16 applied to 3154.5 acres. When initial analysis of Bailie Ranch was done in 1995, no value was given to the existing habitat. The 2002 acreage is about 335 acres less than in 1995. This is primarily seen in lower shrub steppe acres between 2002 and 1995. The credit value is 1.1 HUs. This is based on the positive change in acreage for chukar cover types between 1995 and 2002.
Benton City	The 2002 results show a total of 4.4 HUs, with an overall HSI value of 0.4 applied to 11 acres. The HSI value in 1995 was zero. The 2002 acreage is slightly lower than in 1995. The credit value is 2.2 HUs. This is based on the 50 percent credit on existing habitat. This is 2.2 more than in 1995.
Burma	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 0.6 acres. The HSI value in 1995 was also zero. There was no change in habitat value.

Campbell	The 2002 results show a total of 532 HUs, with an overall HSI value of 1.0 applied to 532 acres. The HSI value in 1995 was 0.7. The 2002 acreage is about 27 acres more than in 1995. This is mainly due to mapping differences between 2002 and 1995. In this case, the acreages were left as they were. The credit value is 266 HUs. This is based on the 50 percent credit on existing habitat. This is 84 more than in 1995.
Central Ferry	The 2002 results show a total of 114.5 HUs, with an overall HSI value of 0.4 applied to 286 acres. The HSI value in 1995 was zero. The 2002 acreage is 185 acres more than in 1995. This is due to the conversion of pasture to grassland. The credit value is 57 HUs. This is based on the 50 percent credit on existing habitat. This is 57 more than in 1995.
Couse Creek	The 2002 results show a total of 1.3 HU, with an overall HSI value of 0.8 applied to 1.6 acres. The HSI value in 1995 was 0.7. The 2002 acreage is same as in 1995. The credit value is 0.6 HUs. This is based on the 50 percent credit on existing habitat. This is slightly more than in 1995.
Donald Road	The 2002 results show a total of 7 HUs, with an overall HSI value of 0.3 applied to 22 acres. The HSI value in 1995 was zero. The 2002 acreage is about 4 less than in 1995. This primarily resulted from decreases of grassland, and increases in scrub shrub habitats. The credit value is 3.5 HUs. This is based on the 50 percent credit on existing habitat. This is 3.5 more than in 1995.
Ferry Road	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 22 acres. The HSI value in 1995 was also zero. The credit value is zero HUs. This is based on the 50 percent credit on existing habitat. There was no change in habitat value.

Fisher Gulch	The 2002 results show a total of 1631 HUs, with an overall HSI value of 1.0 applied to 1631 acres. The HSI value in 1995 was 0.7. The 2002 acreage is about 45 acres less than in 1995. This is primarily seen in decreases of total acreage between 1995 and 2002. The credit value is 816 HUs. This is based on the 50 percent credit on existing habitat. This is 212 more than in 1995. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.
Hartsock	The 2002 results show a total of 2332 HUs, with an overall HSI value of 1.0 applied to 2332 acres. The HSI value in 1995 was 0.4. The 2002 acreage is slightly more than in 1995. The credit value is 1166 HUs. This is based on the 50 percent credit on existing habitat. This is 750 more than in 1995, which far exceeds the projected HU figure of 415.5. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.
John Henley	The 2002 results show a total of 583 HUs, with an overall HSI value of 0.8 applied to 740 acres. The HSI value in 1995 was zero. The 2002 acreage is about 150 acres more than in 1995. This is mainly attributed to the conversion of pasture and shrub steppe to grassland. The credit value is 291.5 HUs. This is based on the 50 percent credit on existing habitat. This is 291.5 more than in 1995, which exceeds the projected HU figure of 221. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.
Kelly Bar	The 2002 results show a total of 227 HUs, with an overall HSI value of 0.97 applied to 234 acres. The HSI value in 1995 was 0.4. The 2002 acreage is 18 acres less than in 1995. This is primarily seen in decreases of total acreage between 1995 and 2002. The credit value is 113.5 HUs. This is based on the 50 percent credit on existing habitat. This is 63 more than in 1995, which exceeds the projected HU figure of 97. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.

McDonald Bridge	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 27 acres. The HSI value in 1995 was also zero. The 2002 acreage is 13 more than in 1995. This is mainly attributed to higher grassland acreage. The credit value is zero HUs. This is based on the 50 percent credit on existing habitat. There was no change in habitat value.
Mill Creek	The 2002 results show a total of 24 HUs, with an overall HSI value of 0.4 applied to 59 acres. The HSI value in 1995 was 0.43. The 2002 acreage is 59 more than in 1995. This is due to the conversion of crop to grassland and mesic shrub. The credit value is 12 HUs. This is based on the 50 percent credit on existing habitat. This is 11.8 more than in 1995.
Naches	The 2002 results show a total of 0.3 HUs, with an overall HSI value of 0.2 applied to 2 acres. The HSI value in 1995 was zero. The 2002 acreage is slightly higher than in 1995. The credit value is 0.2 HUs. This is based on the 50 percent credit on existing habitat. This is 0.2 more than in 1995.
Nisqually John	The 2002 results show a total of 2288 HUs, with an overall HSI value of 0.8 applied to 2983 acres. The HSI value in 1995 was 0.7. The 2002 acreage is slightly higher than to those in 1995. The credit value is 1144 HUs. This is based on the 50 percent credit on existing habitat. This is about 75 more than in 1995.
Pintler	The 2002 results show a total of 3458 HUs, with an overall HSI value of 0.8 applied to 4323 acres. The HSI value in 1995 was 0.76. The 2002 acreage is about 20 acres less than in 1995. The credit value is 1729 HUs. This is based on the 50 percent credit on existing habitat. This is 79 more than in 1995.
Revere Ranch	The 2002 results show a total of 796 HUs, with an overall HSI value of 0.4 applied to 1992 acres. The HSI value in 1995 was zero. The 2002 acreage is about 35 acres less than in 1995. The credit value is 398 HUs. This is based on the 50 percent credit on existing habitat. This is 398 more than in 1995. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.

Rice Bar	The 2002 results show a total of 86 HUs, with an overall HSI value of 0.4 applied to 214 acres. The HSI value in 1995 was zero. The 2002 acreage is a 156 higher than in 1995. This is due to the conversion of crop and shrub steppe to grassland. The credit value is 43 HUs. This is based on the 50 percent credit on existing habitat. This is 43 more than in 1995. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.
Shumaker	The 2002 results show a total of 2036 HUs, with an overall HSI value of 1.0 applied to 2036 acres. The HSI value in 1995 was 0.7. The 2002 acreage is 26 lower than in 1995. Most of this is in lower exposed rock and mesic shrub acres. The credit value is 1018 HUs. This is based on the 50 percent credit on existing habitat. This is 285 more than in 1995. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.
Sulphur Creek	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 69 acres. The HSI value in 1995 was also zero. The 2002 acreage is 10 acres lower than in 1995. The credit value is zero HUs. This is based on the 50 percent credit on existing habitat. No change in habitat value.
Swank	The 2002 results show a total of 23 HUs, with an overall HSI value of 1.0 applied to 23 acres. The HSI value in 1995 was 0.9. The 2002 acreage is slightly more than in 1995. The credit value is 11.5 HUs. This is based on the 50 percent credit on existing habitat. This is 1.3 more than in 1995.
Swegle	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 29 acres. The HSI value in 1995 was also zero. The 2002 acreage was slightly lower than in 1995. The credit value is zero HUs. This is based on the 50 percent credit on existing habitat. No change in habitat value.

Wallula HMU	The 2002 results show a total of 58 HUs, with an overall HSI value of 0.4 applied to 155 acres. The HSI value in 1995 was zero. The 2002 acreage is about 143 more than in 1995. This is mainly due to the conversion of pasture to grass, and shrub and tree plots. The credit value is 29 HUs. This is based on the 50 percent credit on existing habitat. This is 29 more than in 1995.
Whitstran	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 13 acres. The HSI value in 1995 was also zero. The 2002 acreage was slightly lower than in 1995. The credit value is zero HUs. This is based on the 50 percent credit on existing habitat. No change in habitat value.
Willow Bar	The 2002 results show a total of 16 HUs, with an overall HSI value of 0.4 applied to 40 acres. The HSI value in 1995 was zero. The 2002 acreage is 40 higher than in 1995. This is mainly due to the conversion of cropland to grass. The credit value is 8 HUs. This is based on the 50 percent credit on existing habitat. This is 8 more than in 1995. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.
Windmill Ranch	The 2002 results show a total of 279 HUs, with an overall HSI value of 0.4 applied to 701 acres. The HSI value in 1995 was zero. The 2002 acreage is over 200 less than in 1995. This is reflected in the decreases in grassland cover types. The credit value is 139.5 HUs. This is based on the 50 percent credit on existing habitat. This is about 139.5 more than in 1995. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.

5.4 Downy Woodpecker

Upper Pools, Lower Snake River	The 2001 results show a total of 128.6 HUs, with an overall HSI value of 0.8 applied to 163.6 acres. The HSI values in 1989 and 1958 were 0.6 and 1.0, respectively. The acreage in 2001 is about 46 higher than in 1989. The resulting HUs in 2001 were about 59 higher than in 1989. This is still about 380 less than what was calculated in 1958. The increase in HSI between 1989 and 2001 is reflected in an increase in both size of trees and number of snags per plot.
Lower Pools, Lower Snake River	The 2001 results show a total of 56 HUs, with an overall HSI value of 0.2 applied to 279.6 acres. The HSI values in 1989 and 1958 were 0.03 and 1.0, respectively. The acreage in 2001 is about 168 higher than in 1989. The resulting HUs in 2001 were about 52 higher than in 1989. This is still about 146 less than what was calculated in 1958. The increase in HSI between 1989 and 2001 is reflected in an increase in both size of trees and number of snags per plot.
Bailie Ranch	The 2002 results show a total of 28.2 HUs, with an overall HSI value of 0.33 applied to 84.7 acres. When initial analysis of Bailie Ranch was done in 1995, no value was given to the existing habitat. The 2002 acreage is about 20 acres more than in 1995. The credit value is 6.6 HUs. This is based on the positive change in acreage for downy woodpecker cover types between 1995 and 2002.
Benton City	The 2002 results show a total of 4.5 HUs, with an overall HSI value of 0.99 applied to 4.6 acres. The HSI value in 1995 was 0.9. The 2002 acreage is 0.4 higher than in 1995. The credit value is 2.3 HUs. This is based on the 50 percent credit on existing habitat. This is about 0.4 more than in 1995.
Burma	The 2002 results show a total of 0.15 HU, with an overall HSI value of 0.5 applied to 0.3 acres. The HSI value in 1995 was 1. The 2002 acreage is 0.2 lower than in 1995. The credit value is 0.08 HU. This is based on the 50 percent credit on existing habitat. This is about 0.2 less than in 1995.

Campbell	The 2002 results show a total of 22 HUs, with an overall HSI value of 0.9 applied to 24.7 acres. The HSI value in 1995 was 0.5. The 2002 acreage is about 5 higher than in 1995. The credit value is 11 HUs. This is based on the 50 percent credit on existing habitat. This is about 6 more than in 1995, which is 2 less than the projected HU figure of 13. Since this model is based on the minimum suitability index, an improvement has to occur in both the tree basal area and snag numbers to improve the total HSI.
Central Ferry	No palustrine forest for downy woodpecker is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Couse Creek	The 2002 results show a total of 0.4 HU, with an overall HSI value of 0.8 applied to 0.5 acres. The HSI value in 1995 was 0.1. The 2002 acreage is 0.3 lower than in 1995. The credit value is 0.2 HU. This is based on the 50 percent credit on existing habitat. This is about 0.16 higher than in 1995, which is slightly less than the projected HU figure of 0.4. Since this model is based on the minimum suitability index, an improvement has to occur in both the tree basal area and snag numbers to improve the total HSI.
Donald Road	The 2002 results show a total of 16.5 HUs, with an overall HSI value of 0.5 applied to 33 acres. The HSI value in 1995 was 0.9. The 2002 acreage is about 1.7 higher than in 1995. The credit value is 8.3 HUs. This is based on the 50 percent credit on existing habitat. This is about 6 less than in 1995. Since this model is based on the minimum suitability index, a decline has to occur in one or both the tree basal area and snag numbers to reduce the total HSI.
Ferry Road	The 2002 results show a total of 0.15 HU, with an overall HSI value of 0.5 applied to 0.3 acres. The HSI value in 1995 was 0.2. The 2002 acreage is 0.5 lower than in 1995. The credit value is 0.08 HU. This is based on the 50 percent credit on existing habitat. This is equal to the results in 1995, which is less than the projected HU figure of 0.6.

Fisher Gulch	The 2002 results show a total of 2.5 HUs, with an overall HSI value of 1.0 applied to 2.5 acres. The HSI value in 1995 was 0.5. The 2002 acreage is about 12 less than in 1995. The credit value is 1.3 HUs. This is based on the 50 percent credit on existing habitat. This is about 2.3 less than in 1995, which is about 4.5 less than the projected HU figure of 5.7. Since this model is based on the minimum suitability index, an improvement has to occur in both tree basal area and snag numbers to improve the total HSI.
Hartsock	The 2002 results show a total of 37.7 HUs, with an overall HSI value of 0.5 applied to 75.4 acres. The HSI value in 1995 was 0.9. The 2002 acreage is about 26 less than in 1995. The credit value is 18.9 HUs. This is based on the 50 percent credit on existing habitat. This is about 26 less than in 1995, which is about 33 less than the projected HU figure of 52. Since this model is based on the minimum suitability index, a decline has to occur in one or both the tree basal area and snag numbers to reduce the total HSI.
John Henley	The 2002 results show a total of 0.15 HU, with an overall HSI value of 0.5 applied to 0.3 acres. The HSI value in 1995 was zero. The 2002 acreage is 0.3 higher than in 1995. The credit value is 0.08 HU. This is based on the 50 percent credit on existing habitat. This is 0.08 higher than in 1995.
Kelly Bar	The 2002 results show a total of 0.84 HU, with an overall HSI value of 0.77 applied to 1.1 acres. The HSI value in 1995 was 0.2. The 2002 acreage is about 1.0 less than in 1995. The credit value is 0.4 HU. This is based on the 50 percent credit on existing habitat. This is 0.2 higher than in 1995, which is less than the projected HU figure of 1.2. Since this model is based on the minimum suitability index, an improvement has to occur in both tree basal area and snag numbers to improve the total HSI. Kelly Bar's HSI was derived from data for Nisqually John. The 2002 HSI needs to be looked on as an estimate. There should have been some HSI increase since 1995, but the small size of the palustrine forest acreage indicates that the improvements would be small.

McDonald Bridge	The 2002 results show a total of 27.3 HUs, with an overall HSI value of 0.87 applied to 31.5 acres. The HSI value in 1995 was 0.9. The 2002 acreage is about 4 less than in 1995. The credit value is 13.7 HUs. This is based on the 50 percent credit on existing habitat. This is about 4 less than in 1995.
Mill Creek	No palustrine forest for downy woodpecker is found on this site. No HSI data was collected, so the site provides no habitat value for this species. The projected HU figure for this species is 5.3. It is unlikely the current plantings will meet these goals.
Naches	The 2002 results show a total of 1.0 HU, with an overall HSI value of 0.5 applied to 2 acres. The HSI value in 1995 was 0.2. The 2002 acreage is about 0.4 less than in 1995. The credit value is 0.5 HUs. This is based on the 50 percent credit on existing habitat. This is about 0.3 more than in 1995, which is about 1.4 less than the projected HU figure of 1.9.
Nisqually John	The 2002 results show a total of 52.4 HUs, with an overall HSI value of 0.77 applied to 68.3 acres. The HSI value in 1995 was 0.9. The 2002 acreage is about 21 less than in 1995. The credit value is 26.2 HUs. This is based on the 50 percent credit on existing habitat. This is about 14 less than in 1995, which is about 15 less than the projected HU figure of 41.
Pintler	The 2002 results show a total of 25 HUs, with an overall HSI value of 0.94 applied to 26.5 acres. The HSI value in 1995 was 0.5. The 2002 acreage is about 8 more than in 1995. The credit value is 12.4 HUs. This is based on the 50 percent credit on existing habitat. This is about 8 more than in 1995, which is about 8 less than the projected HU figure of 20. Since this model is based on the minimum suitability index, an improvement has to occur in both tree basal area and snag numbers to improve the total HSI.

Revere Ranch	The 2002 results show a total of 8.5 HUs, with an overall HSI value of 1.0 applied to 8.5 acres. The HSI value in 1995 was 0.9. The 2002 acreage is slightly less than in 1995. The credit value is 4.3 HUs. This is based on the 50 percent credit on existing habitat. This is slightly more than in 1995, which is about 5 less than the projected HU figure of 9.5.
Rice Bar	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 0.6 acres. The HSI value in 1995 was 0.1. The 2002 acreage is about 0.6 more than in 1995. There is no credit value so the habitat value remains unchanged as compared to 1995. The projected HU figure for this species is 7.9.
Shumaker	The 2002 results show a total of 6 HUs, with an overall HSI value of 0.5 applied to 12 acres. The HSI value in 1995 was zero. The 2002 acreage is 6.4 less than in 1995. The credit value is 3 HUs. This is based on the 50 percent credit on existing habitat. This is 3 more than in 1995, which is about 6 less than the projected HU figure of 9. It is suspected that no snags were found in 1995. If either the number of snags or the basal area is zero, the HSI is zero.
Sulphur Creek	The 2002 results show a total of zero HUs, with an overall HSI value of 0.85 applied to zero acres. The HSI value in 1995 was 0.2. The 2002 acreage is 1.7 less than in 1995. The reason for this is palustrine forest was reclassified as mesic shrub in 2002. Data was collected for palustrine forest to generate an HSI, but it was felt the Russian olive grove was more indicative of mesic shrub and so was changed. There is no credit value so the habitat value was reduced by 0.2 HU as compared to 1995. The projected HU figure for this species is 1.4. With enhancements of the current shrub areas, this goal is attainable at this site.

Swank	The 2002 results show a total of zero HUs, with an overall HSI value of 0.5 applied to zero acres. The HSI value in 1995 was zero. The 2002 acreage is 3.1 less than in 1995. The reason for this is palustrine forest was reclassified as mesic shrub in 2002. No data was collected at this site, the HSI was generated from sampling at Shumaker. The tree spacing and location were more indicative of mesic shrub and so was changed. There is no credit value so the habitat value was left unchanged as compared to 1995. The projected HU figure for this species is 0.6. Some riparian forest should develop on this site over time. This goal is attainable on this site.
Swegle	The 2002 results show a total of 18.5 HUs, with an overall HSI value of 0.5 applied to 37 acres. The HSI value in 1995 was 1. The 2002 acreage is about 4 less than in 1995. The credit value is 9.3 HUs. This is based on the 50 percent credit on existing habitat. This is 11.4 less than in 1995. Since this model is based on the minimum suitability index, a decline has to occur in one or both the tree basal area and snag numbers to reduce the total HSI.
Wallula HMU	The 2002 results show a total of 2.4 HUs, with an overall HSI value of 0.87 applied to 2.8 acres. The HSI value in 1995 was zero. The 2002 acreage is 2.8 more than in 1995. The credit value is 2.2 HUs. This is based on the 50 percent credit on existing habitat. This is 2.2 more than in 1995, which is about 2 less than the projected HU figure of 4.3. Since this model is based on the minimum suitability index, an improvement has to occur in both tree basal area and snag numbers to improve the total HSI. Wallula's HSI was derived from data for McDonald Bridge. The 2002 HSI needs to be looked on as an estimate. There should have been some HSI increase since 1995, but the small size of the palustrine forest acreage indicates that the improvements would be small.

Whitstran	The 2002 results show a total of 0.14 HU, with an overall HSI value of 0.2 applied to 0.7 acres. The HSI value in 1995 was 0.2. The 2002 acreage is about 1.3 less than in 1995. The credit value is 0.07 HUs. This is based on the 50-percent credit on existing habitat. This is about 0.13 less than in 1995, which is about 1.5 less than the projected HU figure of 1.6.
Willow Bar	No palustrine forest for downy woodpecker is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Windmill Ranch	The 2002 results show a total of 2.7 HUs, with an overall HSI value of 1.0 applied to 2.7 acres. The HSI value in 1995 was 0.9. The 2002 acreage is slightly less than in 1995. The credit value is 1.35 HUs. This is based on the 50 percent credit on existing habitat. This is the same as what was calculated in 1995, which is about 1.8 less than the projected HU figure of 3.2.

5.5 Mallard

Upper Pools, Lower Snake River	The 2001 results show a total of 21 HUs, with an overall HSI value of 0.1 applied to 196.4 acres. The HSI values in 1989 and 1958 were 0.16 and 0.33, respectively. The acreage in 2001 is the same as in 1989. The palustrine open water acreage was carried over to 2001 since this would remain unchanged. The resulting HUs in 2001 were about 10 less than in 1989. This is about 30 less than what was calculated in 1958. The decrease in HSI between 1989 and 2001 is reflected in an increase in human disturbance in the region.
Lower Pools, Lower Snake River	The 2001 results show a total of 34.25 HUs, with an overall HSI value of 0.1 applied to 308.3 acres. The HSI values in 1989 and 1958 were 0.21 and 0.28, respectively. The acreage in 2001 is the same as in 1989. The palustrine open water acreage was carried over to 2001 since this would remain unchanged. The resulting HUs in 2001 were about 30 less than in 1989. This is about 5 less than what was calculated in 1958. The decrease in HSI between 1989 and 2001 is reflected in an increase in human disturbance in the region.

Bailie Ranch	The 2002 results show a total of 40 HUs, with an overall HSI value of 0.48 applied to 83 acres. When initial analysis of Bailie Ranch was done in 1995, no value was given to the existing habitat. The 2002 acreage is about 7 acres more than in 1995. This is primarily a difference in mapping between 1995 and 2002. The credit value is zero HUs. No value is given since increases in habitat were due to mapping differences between 1995 and 2002.
Benton City	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Burma	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Campbell	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Central Ferry	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Couse Creek	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Donald Road	The 2002 results show a total of 0.5 HU, with an overall HSI value of 0.2 applied to 2.2 acres. The HSI value in 1995 was 0.54. The 2002 acreage is slightly higher than in 1995. The credit value is 0.25 HU. This is based on the 50 percent credit on existing habitat. This is 0.25 less than in 1995. The reduction is probably due to the human disturbance factor.
Ferry Road	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Fisher Gulch	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.

Hartsock	The 2002 results show a total of 0.14 HU, with an overall HSI value of 0.24 applied to 0.6 acre. The HSI value in 1995 was zero. The 2002 acreage is 2.1 lower than in 1995. The credit value is 0.07 HU. This is based on the 50 percent credit on existing habitat. This is 0.07 more than in 1995, which is about 1 less than the projected HU figure of 1.5.
John Henley	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Kelly Bar	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
McDonald Bridge	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Mill Creek	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Naches	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Nisqually John	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Pintler	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Revere Ranch	The 2002 results show a total of 13 HUs, with an overall HSI value of 0.6 applied to 21.8 acres. The HSI value in 1995 was 0.54. The 2002 acreage is about 17 more than in 1995. This is primarily a mapping difference between 1995 and 2002. The credit value is 6.5 HUs. This is based on the 50 percent credit on existing habitat. This is 5 more than in 1995.
Rice Bar	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.

Shumaker	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Sulphur Creek	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Swank	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Swegle	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Wallula HMU	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Whitstran	The 2002 results show a total of 0.3 HU, with an overall HSI value of 0.27 applied to one acre. The HSI value in 1995 was 0.54. The 2002 acreage is 0.7 higher than in 1995. The credit value is 0.2 HU. This is based on the 50 percent credit on existing habitat. This is 0.1 more than in 1995. The reduction is probably due to the human disturbance factor.
Willow Bar	No palustrine open water for mallard is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Windmill Ranch	The 2002 results show a total of 14 HUs, with an overall HSI value of 0.24 applied to 58.4 acres. The HSI value in 1995 was 0.3. The 2002 acreage is 32.4 higher than in 1995. This is primarily a mapping difference between 1995 and 2002. The credit value is 7 HUs. This is based on the 50 percent credit on existing habitat. This is about 3 more than in 1995, which exceeds the projected HU figure of 6.

5.6 Marsh Wren

Upper Pools, Lower Snake River	The 2001 results show a total of 22 HUs, with an overall HSI value of 0.2 applied to 104 acres. The HSI values in 1989 and 1958 were zero and zero respectively. The acreage in 2001 is about 91 higher than in 1989. The resulting HUs in 2001 were 22 higher than in 1989. This is also 22 more than what was calculated in 1958. The primary reason HSI values were zero in 1989 and 1958 was the water depth variable. The sites sampled in 1989 had a water depth of zero. This zeros out the HSI.
Lower Pools, Lower Snake River	The 2001 results show a total of 65 HUs, with an overall HSI value of 0.25 applied to 260 acres. The HSI values in 1989 and 1958 were 0.27 and 0.27 respectively. The acreage in 2001 is 157 more than that measured in 1989. The resulting HUs in 2001 were about 37 higher than in 1989. This is about 64 more than what was calculated in 1958.
Bailie Ranch	The 2002 results show a total of 52.6 HUs, with an overall HSI value of 0.4 applied to 128 acres. When initial analysis of Bailie Ranch was done in 1995, no value was given to the existing habitat. The 2002 acreage is about 67 acres more than in 1995. The credit value is zero HUs. No value is given since increases in habitat were due to mapping differences. Some habitat was probably gained between 1995 and 2002, but it was not developed.
Benton City	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Burma	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Campbell	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Central Ferry	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.

Couse Creek	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Donald Road	The 2002 results show a total of 0.8 HUs, with an overall HSI value of 0.36 applied to 2.2 acres. The HSI value in 1995 was 0.33. The 2002 acreage is 1.7 higher than what was measured in 1995. The credit value is 0.4 HUs. This is based on the 50 percent credit on existing habitat. This is about 0.3 more than in 1995.
Ferry Road	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Fisher Gulch	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Hartsock	The 2002 results show a total of 1.4 HUs, with an overall HSI value of 0.9 applied to 1.5 acres. The HSI value in 1995 was zero. The 2002 acreage is 1.0 higher than what was measured in 1995. The credit value is 0.7 HUs. This is based on the 50 percent credit on existing habitat. This is about 0.7 more than in 1995.
John Henley	No palustrine emergent habitat for marsh wren is found on this site, so the site provides no habitat value for this species. An HSI value was derived from field sampling at the site. It turned out this palustrine emergent plot fell outside of the boundary for this site.
Kelly Bar	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
McDonald Bridge	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Mill Creek	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.

Naches	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Nisqually John	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Pintler	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Revere Ranch	The 2002 results show a total of 14 HUs, with an overall HSI value of 0.44 applied to 32 acres. The HSI value in 1995 was 0.42. The 2002 acreage is 22 higher than what was measured in 1995. The credit value is 7 HUs. This is based on the 50 percent credit on existing habitat. This is about 5 more than in 1995.
Rice Bar	No Palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Shumaker	No Palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Sulphur Creek	The 2002 results show a total of 2 HUs, with an overall HSI value of 0.28 applied to 6.9 acres. The HSI value in 1995 was 0.24. The 2002 acreage is 6.1 higher than what was measured in 1995. The credit value is 1 HU. This is based on the 50 percent credit on existing habitat. This is about 1.9 more than in 1995, which exceeds the projected HU figure of 0.1.
Swank	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Swegle	The 2002 results show a total of 0.2 HUs, with an overall HSI value of 0.9 applied to 0.2 acres. The HSI value in 1995 was zero. The 2002 acreage is 0.2 higher than what was measured in 1995. The credit value is 0.1 HUs. This is based on the 50 percent credit on existing habitat. This is about 0.1 more than in 1995.

Wallula HMU	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Whitstran	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 0.2 acres. The HSI value in 1995 was 0.69. The 2002 acreage is 1.2 lower than what was measured in 1995. The credit value is zero HUs. This is based on the 50 percent credit on existing habitat. This is about 0.5 less than in 1995. Water depth at this site was zero during measurements.
Willow Bar	No palustrine emergent habitat for marsh wren is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Windmill Ranch	The 2002 results show a total of 27 HUs, with an overall HSI value of 0.53 applied to 50.3 acres. The HSI value in 1995 was 0.33. The 2002 acreage is 23.3 higher than what was measured in 1995. The credit value is 13.5 HUs. This is based on the 50 percent credit on existing habitat. This is about 9 more than in 1995, which exceeds the projected HU figure of 7.4. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. One reason might be that the managed wetlands probably have more water in them now, especially during the sampling period.

5.7 Mule Deer

Upper Pools, Lower Snake River	The 2001 results show a total of 3236.5 HUs, with an overall HSI value of 0.35 applied to 9139 acres. The HSI values in 1989 and 1958 were 0.34. The acreage in 2001 is about 450 higher than in 1989. This is mainly reflected by increases in mesic shrub, and shrub steppe cover types. The resulting HUs in 2001 were about 250 higher than in 1989. This is still about 1230 less than what was calculated in 1958.

Lower Pools, Lower Snake River	The 2001 results show a total of 2439.6 HUs, with an overall HSI value of 0.29 applied to 8375 acres. The HSI values in 1989 and 1958 were 0.35 and 0.29 respectively. The acreage in 2001 is about 217 less than in 1989. This is mainly reflected by lower acres in the grassland shrub steppe high cover types. The resulting HUs in 2001 were about 600 less than in 1989. This is about 1300 less than what was calculated in 1958.
Bailie Ranch	The 2002 results show a total of 535.6 HUs, with an overall HSI value of 0.16 applied to 3305 acres. When initial analysis of Bailie Ranch was done in 1995, no value was given to the existing habitat. The 2002 acreage is about 260 acres less than in 1995. This is primarily seen in lower shrub steppe acres between 2002 and 1995. The credit value is 40.8 HUs. This is based on the positive change in acreage for mule deer cover types between 1995 and 2002.
Benton City	The 2002 results show a total of 8.4 HUs, with an overall HSI value of 0.5 applied to 16.8 acres. The HSI value in 1995 was 0.45. The 2002 acreage is slightly higher than in 1995. The credit value is 4.2 HUs. This is based on the 50 percent credit on existing habitat. This is 0.8 more than in 1995, which exceeds the projected HU figure of 4.
Burma	The 2002 results show a total of 0.2 HUs, with an overall HSI value of 0.35 applied to 0.6 acres. The HSI value in 1995 was 0.29. The 2002 acreage is 2.5 acres less than in 1995. This is due to the inability to determine the exact boundaries of the site. The maps and information in the letter supplement give little detail as to the real boundary of this PFA. The 2002 total acreage was much less than reported in 1995. Since the acres are less and no other corroborative data could be found, the data were left alone. The credit value is 0.1 HUs. This is based on the 50 percent credit on existing habitat. This is almost 0.35 HUs less than in 1995.

Campbell	The 2002 results show a total of 182 HUs, with an overall HSI value of 0.34 applied to 529 acres. The HSI value in 1995 was 0.29. The 2002 acreage is about 32 acres more than in 1995. This is mainly due to mapping differences between 2002 and 1995. In this case, the acreages were left as they were. The credit value is 91 HUs. This is based on the 50 percent credit on existing habitat. This is 19 more than in 1995, which is 14 less than the projected HU figure of 105.
Central Ferry	The 2002 results show a total of 69.5 HUs, with an overall HSI value of 0.24 applied to 286 acres. The HSI value in 1995 was 0.23. The 2002 acreage is 185 acres more than in 1995. This is due to the conversion of pasture to grassland. The credit value is 34.7 HUs. This is based on the 50 percent credit on existing habitat. This is 23 more than in 1995, which is 11 less than the projected HU figure of 45.8.
Couse Creek	The 2002 results show a total of 1.25 HU, with an overall HSI value of 0.35 applied to 2.3 acres. The HSI value in 1995 was 0.5. The 2002 acreage is slightly lower than that of 1995. The credit value is 0.6 HUs. This is based on the 50 percent credit on existing habitat. This is slightly more than in 1995, which is 0.6 less than the projected HU figure of 1.2.
Donald Road	The 2002 results show a total of 53 HUs, with an overall HSI value of 0.75 applied to 71 acres. The HSI value in 1995 was 0.5. The 2002 acreage is about 6 more than in 1995. This primarily seen in decreases of grassland, and increases in scrub shrub and forb habitats. The credit value is 26.5 HUs. This is based on the 50 percent credit on existing habitat. This is 10.4 more than in 1995. The HSI increase is seen in improvements of the palustrine forest, palustrine scrub and mesic shrub HSIs. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.

Ferry Road	The 2002 results show a total of 13.2 HUs, with an overall HSI value of 0.29 applied to 46 acres. The HSI value in 1995 was 0.05. The 2002 acreage is about 3 more than in 1995. The credit value is 6.6 HUs. This is based on the 50 percent credit on existing habitat. This is 5.5 more than in 1995, which is about 2 less than the projected HU figure of 8.8. The HSI increase is seen in improvements of the grassland and palustrine forest cover type HSIs. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.
Fisher Gulch	The 2002 results show a total of 518 HUs, with an overall HSI value of 0.4 applied to 1419 acres. The HSI value in 1995 was 0.25. The 2002 acreage is about 170 acres less than in 1995. This is primarily seen in increases in exposed rock and decreases in grassland acreage between 1995 and 2002. The credit value is 259 HUs. This is based on the 50 percent credit on existing habitat. This is 60 more than in 1995, which exceeds the projected HU figure of 245. The HSI increase is seen in improvements of all the cover type HSIs. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.
Hartsock	The 2002 results show a total of 955 HUs, with an overall HSI value of 0.4 applied to 2439.5 acres. The HSI value in 1995 was 0.3. The 2002 acreage is slightly less than in 1995. The credit value is 477.5 HUs. This is based on the 50 percent credit on existing habitat. This is 88 more than in 1995, which exceeds the projected HU figure of 403. This is mainly seen in improvements of the grassland HSI. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.

John Henley	The 2002 results show a total of 190 HUs, with an overall HSI value of 0.28 applied to 685 acres. The HSI value in 1995 was also 0.28. The 2002 acreage is about 175 acres more than in 1995. The HSI increase is mainly attributed to the conversion of pasture and shrub steppe to grassland. The credit value is 95 HUs. This is based on the 50 percent credit on existing habitat. This is 24 more than in 1995, which is about 1 less than the projected HU figure of 96.
Kelly Bar	The 2002 results show a total of 73.3 HUs, with an overall HSI value of 0.44 applied to 165 acres. The HSI value in 1995 was 0.1. The 2002 acreage is 65 acres less than in 1995. This is primarily seen in increase in exposed rock and decreases of total acreage between 1995 and 2002. The credit value is 36.6 HUs. This is based on the 50 percent credit on existing habitat. This is 24 more than in 1995, which exceeds the projected HU figure of 31. The HSI increase is mainly seen in improvements of the grassland HSI. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.
McDonald Bridge	The 2002 results show a total of 23 HUs, with an overall HSI value of 0.3 applied to 76.3 acres. The HSI value in 1995 was 0.35. The 2002 acreage is the same as in 1995. The credit value is 11.5 HUs. This is based on the 50 percent credit on existing habitat. This is 2 less than in 1995.
Mill Creek	The 2002 results show a total of 16 HUs, with an overall HSI value of 0.27 applied to 60 acres. The HSI value in 1995 was 0.04. The 2002 acreage is 59 more than in 1995. This is due to the conversion of crop to grassland and mesic shrub. The credit value is 8 HUs. This is based on the 50 percent credit on existing habitat. This is 8 more than in 1995, which is about 13.5 less than the projected HU figure of 21.6. The HSI increase is mainly seen in improvements of the grassland HSI. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.

Naches	The 2002 results show a total of 1.4 HUs, with an overall HSI value of 0.2 applied to 6.6 acres. The HSI value in 1995 was 0.4. The 2002 acreage is slightly higher than in 1995. The credit value is 0.7 HUs. This is based on the 50 percent credit on existing habitat. This is 0.5 less than in 1995, which is about 0.7 less than the projected HU figure of 1.4.
Nisqually John	The 2002 results show a total of 782 HUs, with an overall HSI value of 0.3 applied to 2490 acres. The HSI value in 1995 was 0.37. The 2002 acreage is about 125 less than that of 1995. This is mainly due to the increase in exposed rock and subsequent loss of grassland between 1995 and 2002. The credit value is 391 HUs. This is based on the 50 percent credit on existing habitat. This is about 93 less than in 1995, which is about 378 less than the projected HU figure of 769.
Pintler	The 2002 results show a total of 1354 HUs, with an overall HSI value of 0.3 applied to 4133 acres. The HSI value in 1995 was 0.27. The 2002 acreage is about 73.5 acres less than in 1995. This is mainly due to the increase in exposed rock and subsequent loss of grassland between 1995 and 2002. The credit value is 677 HUs. This is based on the 50 percent credit on existing habitat. This is 109 more than in 1995, which exceeds the projected HU figure of 610.
Revere Ranch	The 2002 results show a total of 516.7 HUs, with an overall HSI value of 0.27 applied to 1906 acres. The HSI value in 1995 was 0.23. The 2002 acreage is about 170 acres less than in 1995. This is mainly due to the increase in exposed rock and subsequent loss of grassland between 1995 and 2002. The credit value is 258.4 HUs. This is based on the 50 percent credit on existing habitat. This is about 20 more than in 1995, which is about 35 less than the projected HU figure of 293.

Rice Bar	The 2002 results show a total of 63 HUs, with an overall HSI value of 0.3 applied to 215 acres. The HSI value in 1995 was 0.3. The 2002 acreage is a 195 higher than in 1995. This is due to the conversion of crop and shrub steppe to grassland. The credit value is 32.5 HUs. This is based on the 50 percent credit on existing habitat. This is about 29 more than in 1995, which is about 45 less than the projected HU figure of 77.4.
Shumaker	The 2002 results show a total of 604 HUs, with an overall HSI value of 0.3 applied to 1932 acres. The HSI value in 1995 was also 0.3. The 2002 acreage is slightly lower than that of 1995. The credit value is 302 HUs. This is based on the 50 percent credit on existing habitat. This is slightly more than in 1995.
Sulphur Creek	The 2002 results show a total of 23.3 HUs, with an overall HSI value of 0.26 applied to 88 acres. The HSI value in 1995 was 0.23. The 2002 acreage is slightly lower than in 1995. The credit value is 11.6 HUs. This is based on the 50 percent credit on existing habitat. This is slightly more than in 1995.
Swank	The 2002 results show a total of 9.3 HUs, with an overall HSI value of 0.5 applied to 19.5 acres. The HSI value in 1995 was 0.09. The 2002 acreage is 6 less than in 1995. The credit value is 4.7 HUs. This is based on the 50 percent credit on existing habitat. This is 3.5 more than in 1995.
Swegle	The 2002 results show a total of 27.2 HUs, with an overall HSI value of 0.33 applied to 83.6 acres. The HSI value in 1995 was 0.35. The 2002 acreage was 4 higher than in 1995. The credit value is 13.6 HUs. This is based on the 50 percent credit on existing habitat. This is slightly less than in 1995.
Wallula HMU	The 2002 results show a total of 52 HUs, with an overall HSI value of 0.3 applied to 170 acres. The HSI value in 1995 was 0.35. The 2002 acreage is about 152 more than in 1995. This is mainly due to the conversion of pasture to grass, and shrub and tree plots. The credit value is 26 HUs. This is based on the 50 percent credit on existing habitat. This is 23 more than in 1995, which is about 44 less than the projected HU figure of 70.

Whitstran	The 2002 results show a total of 9.2 HUs, with an overall HSI value of 0.6 applied to 16 acres. The HSI value in 1995 was also 0.6. The 2002 acreage was 4.5 lower than in 1995. The credit value is 4.6 HUs. This is based on the 50 percent credit on existing habitat. This is about 2 less than in 1995, which is about 2 less than the projected HU figure of 6.6.
Willow Bar	The 2002 results show a total of 10 HUs, with an overall HSI value of 0.25 applied to 40 acres. The HSI value in 1995 was 0.24. The 2002 acreage is 40 higher than in 1995. This is mainly due to the conversion of cropland to grass. The credit value is 5 HUs. This is based on the 50 percent credit on existing habitat. This is 5 more than in 1995, which is about 5.7 less than the projected HU figure of 10.7.
Windmill Ranch	The 2002 results show a total of 350.5 HUs, with an overall HSI value of 0.35 applied to 1003 acres. The HSI value in 1995 was 0.24. The 2002 acreage is over 37 more than in 1995. This is reflected in the increases in shrub-steppe cover types. The credit value is 175.3 HUs. This is based on the 50 percent credit on existing habitat. This is about 59 more than in 1995, which exceeds the projected HU figure of 149.

5.8 Ring-Necked Pheasant

Upper Pools, Lower Snake River	The 2001 results show a total of 2418 HUs, with an overall HSI value of 0.8 applied to 3048 acres. The HSI values in 1989 and 1958 were 0.6 and 0.46, respectively. The acreage in 2001 is about 360 higher than in 1989. This is mainly reflected by increases in mesic shrub, palustrine emergent, and palustrine forest and shrub-steppe cover types. The resulting HUs in 2001 were about 745 higher than in 1989. This is still about 2000 less than what was calculated in 1958. The HSI increase in mainly due to an improvement of the reproduction EOA between 1989 and 2001. This is usually reflected in greater herbaceous cover and height. This difference may be attributed to grazing practices in 1958 as compared to today.

Lower Pools, Lower Snake River	The 2001 results show a total of 2025.3 HUs, with an overall HSI value of 0.36 applied to 5403 acres. The HSI values in 1989 and 1958 were 0.29 and 0.4, respectively. The acreage in 2001 is about 190 higher than in 1989. This is mainly reflected by increases in mesic shrub, palustrine emergent, and palustrine forest and shrub-steppe cover types. The resulting HUs in 2001 were about 535 higher than in 1989. This is still about 1140 less than what was calculated in 1958.
Bailie Ranch	The 2002 results show a total of 918.2 HUs, with an overall HSI value of 0.23 applied to 3936 acres. When initial analysis of Bailie Ranch was done in 1995, no value was given to the existing habitat. The 2002 acreage is about equal to those in 1995. The credit value is 66.0 HUs. This is based on the positive change in acreage for ring-necked pheasant cover types between 1995 and 2002.
Benton City	The 2002 results show a total of 5.7 HUs, with an overall HSI value of 0.54 applied to 10.5 acres. The HSI value in 1995 was 0.55. The 2002 acreage is 5 acres higher than in 1995. This is mainly due to the increase in mesic shrubland. The credit value is 2.8 HUs. This is based on the 50 percent credit on existing habitat. This is 1.3 more than in 1995.
Burma	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 0.6 acres. The HSI value in 1995 was 0.4. The main reason for this is lack of winter food and cover near the site. This is 3.1 less than in 1995.
Campbell	The 2002 results show a total of 73.3 HUs, with an overall HSI value of 0.46 applied to 160 acres. The HSI value in 1995 was 0.6. The 2002 acreage is 123 acres less than in 1995. This is mainly due to the reduction of shrub steppe and conversion to grassland. This was probably caused by a wildfire. The credit value is 36.7 HUs. This is based on the 50 percent credit on existing habitat. This is 50 less than in 1995.

Central Ferry	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to zero acres. The HSI value in 1995 was also zero. The 2002 acreage is 185 acres less than in 1995. This is due to the conversion of pasture to grassland. The projected HU figure for this species is 89.
Couse Creek	The 2002 results show a total of 1.0 HU, with an overall HSI value of 0.5 applied to 2 acres. The HSI value in 1995 was 0.6. The 2002 acreage is 0.7 higher than in 1995. This is attributed to increases in palustrine scrub shrub and shrub steppe. The credit value is 0.5 HUs. This is based on the 50 percent credit on existing habitat. This is slightly more than in 1995, which is also less than the projected HU figure of 0.7.
Donald Road	The 2002 results show a total of 24.5 HUs, with an overall HSI value of 0.4 applied to 61 acres. The HSI value in 1995 was 0.55. The 2002 acreage is about 15 more than in 1995. This is primarily seen in increases of annual forb, mesic shrub, and scrub shrub habitats. The credit value is 12.2 HUs. This is based on the 50 percent credit on existing habitat. This is slightly less than in 1995, which is about 7 less than the projected HU figure of 19.
Ferry Road	The 2002 results show a total of 15.7 HUs, with an overall HSI value of 0.19 applied to 82.6 acres. The HSI value in 1995 was 0.01. The 2002 acreage is about 8.5 acres higher than in 1995. The change is primarily due to a shift from pasture to crop, annual forb, mesic shrub and shrub steppe. The credit value is 7.8 HUs. This is based on the 50 percent credit on existing habitat. This is 7.5 more than in 1995.
Fisher Gulch	The 2002 results show a total of 90 HUs, with an overall HSI value of 0.58 applied to 154.8 acres. The HSI value in 1995 was 0.6. The 2002 acreage is about 44 acres more than in 1995. This primarily seen in increases of annual forb, mesic shrub, and scrub shrub habitats. The credit value is 45 HUs. This is based on the 50 percent credit on existing habitat. This is 11.6 more than in 1995.

Hartsock	The 2002 results show a total of 263.4 HUs, with an overall HSI value of 0.7 applied to 376 acres. The HSI value in 1995 was 0.5. The 2002 acreage is slightly more than in 1995. The credit value is 131.7 HUs. This is based on the 50 percent credit on existing habitat. This is 48 more than in 1995, which exceeds the projected HU figure of 129. The overall HSI increase was because of increases in reproduction, winter cover and winter food Equivalent Optimum Areas (EOA). It is difficult to compare figures more than this, since the 1995 data only gives the LRSIs.
John Henley	The 2002 results show a total of 16.7 HUs, with an overall HSI value of 0.4 applied to 43 acres. The HSI value in 1995 was 0.3. The 2002 acreage is 250 acres less than in 1995. This is mainly attributed to the conversion of pasture and shrub steppe to grassland. A large irrigated pasture was planted to dryland grasses and fires have converted some shrub-steppe to grassland. The credit value is 8.3 HUs. This is based on the 50-percent credit on existing habitat. This is almost 31 less than in 1995, which is about 60 less than the projected HU figure of 68.
Kelly Bar	The 2002 results show a total of 22.5 HUs, with an overall HSI value of 0.48 applied to 47.2 acres. The HSI value in 1995 was 0.09. The large difference in HSI values is attributed to the fact that Reproduction LRSI values were much lower in 1995. Kelly Bar field data was derived from Nisqually John HMU. These sites are in close proximity though on opposite sides of the river. Habitat values should be similar. This is reflected in the fact that Nisqually John also having a higher HSI value for pheasant (0.36). The only difference is the distance values calculated for each site and relative habitat percentages. The 2002 acreage is 13 acres less than in 1995. The credit value is 11.3 HUs. This is based on the 50 percent credit on existing habitat. This is 8.5 more than in 1995. The overall HSI increase was because of increases in reproduction, winter cover and winter food EOAs (Equivalent Optimum Areas). It is difficult to compare figures more than this since the 1995 data only gives the LRSIs.

McDonald Bridge	The 2002 results show a total of 40.4 HUs, with an overall HSI value of 0.5 applied to 86.1 acres. The HSI value in 1995 was 0.4. The 2002 acreage is 20 less than in 1995. This is mainly attributed to lower crop, annual forb, and palustrine forest and scrub shrub acres. This is due to river movement and creation of more unconsolidated shore. The credit value is 20.2 HUs. This is based on the 50 percent credit on existing habitat. This is a little less than in 1995.
Mill Creek	The 2002 results show a total of 7.5 HUs, with an overall HSI value of 0.9 applied to 8.3 acres. The HSI value in 1995 was zero. The 2002 acreage is 56 less than in 1995. This is due to the conversion of crop to grassland. The credit value is 3.7 HUs. This is based on the 50 percent credit on existing habitat. This is 3.7 more than in 1995, which is about 53 less than the projected HU figure of 57. The overall HSI increase was because of increases in reproduction, winter cover and winter food EOAs (Equivalent Optimum Areas). It is suspected that the reproduction EOA was the limiting factor in 1995. In a crop situation, no habitat is left for nesting.
Naches	The 2002 results show a total of 3.1 HUs, with an overall HSI value of 0.55 applied to 5.7 acres. The HSI value in 1995 was 0.3. The 2002 acreage is about 1.0 acre higher than in 1995. The credit value is 1.5 HUs. This is based on the 50 percent credit on existing habitat. This is 0.8 more than in 1995. The overall HSI increase was because of increases in reproduction, winter cover and winter food EOAs. It is difficult to compare figures more than this since the 1995 data only gives the LRSIs.
Nisqually John	The 2002 results show a total of 796.4 HUs, with an overall HSI value of 0.36 applied to 2194 acres. The HSI value in 1995 was 0.53. The 2002 acreage is about equal to those in 1995. The credit value is 398 HUs. This is based on the 50 percent credit on existing habitat. This is about 184 less than in 1995, which is about 180 less than the projected HU figure of 578. It is difficult to compare figures more than this since the 1995 data only gives the LRSIs.

Pintler	The 2002 results show a total of 317.8 HUs, with an overall HSI value of 0.44 applied to 729 acres. The HSI value in 1995 was 0.58. The 2002 acreage is about 320 acres more than in 1995. A large part of this difference was an increase in shrub steppe and mesic shrub. The credit value is 160 HUs. This is based on the 50 percent credit on existing habitat. This is 40 more than in 1995, which exceeds the projected HU figure of 139.
Revere Ranch	The 2002 results show a total of 172 HUs, with an overall HSI value of 0.36 applied to 473 acres. The HSI value in 1995 was 0.17. The 2002 acreage is about 72 acres more than in 1995. A large part of this difference was increases in the annual forb, mesic shrub and palustrine emergent cover types. The credit value is 86 HUs. This is based on the 50 percent credit on existing habitat. This is 52 more than in 1995, which exceeds the projected HU figure of 77.
Rice Bar	The 2002 results show a total of 9.2 HUs, with an overall HSI value of 0.37 applied to 24.6 acres. The HSI value in 1995 was 0.2. The 2002 acreage is a 190 lower than in 1995. This is due to the conversion of crop and shrub steppe to grassland. The credit value is 4.6 HUs. This is based on the 50 percent credit on existing habitat. This is 17 less than in 1995, which is about 166 less than the projected HU figure of 170.6.
Shumaker	The 2002 results show a total of 103 HUs, with an overall HSI value of 0.6 applied to 176 acres. The HSI value in 1995 was 0.6. The 2002 acreage is 57 lower than in 1995. Most of this is in lower mesic shrub acres. The credit value is 51.5 HUs. This is based on the 50 percent credit on existing habitat. This is 18 less than in 1995.

Sulphur Creek	The 2002 results show a total of 31.4 HUs, with an overall HSI value of 0.73 applied to 43.3 acres. The HSI value in 1995 was 0.1. The 2002 acreage is 33 acres higher than in 1995. Most of this difference is reflected in higher annual forb, mesic shrub and palustrine emergent cover types. The credit value is 15.7 HUs. This is based on the 50 percent credit on existing habitat. This is 15 more than in 1995. The overall HSI increase was because of increases in reproduction, winter cover and winter food EOAs. It is difficult to compare figures more than this since the 1995 data only gives the LRSIs.
Swank	The 2002 results show a total of 3.7 HUs, with an overall HSI value of 0.6 applied to 6.3 acres. The HSI value in 1995 was 0.35. The 2002 acreage is about 1.7 acres more than in 1995. This is mainly due to the increase in mesic shrub. The credit value is 1.9 HUs. This is based on the 50 percent credit on existing habitat. This is 1.0 more than in 1995. The overall HSI increase was because of increases in reproduction, and winter cover EOAs (Equivalent Optimum Areas). This is only based on a single cover type. The field data was obtained from Shumaker (across the river) so should be representative of the habitat on this site.
Swegle	The 2002 results show a total of 39 HUs, with an overall HSI value of 0.67 applied to 58 acres. The HSI value in 1995 was 0.4. The 2002 acreage is about 10 higher than in 1995. This is mainly reflective of the increase of annual forb. The credit value is 19.5 HUs. This is based on the 50 percent credit on existing habitat. This is almost 10 more than in 1995. The overall HSI increase was because of increases in reproduction, winter cover and winter food EOAs. It is difficult to compare figures more than this since the 1995 data only gives the LRSIs.

Wallula HMU	The 2002 results show a total of 53.4 HUs, with an overall HSI value of 0.82 applied to 65.4 acres. The HSI value in 1995 was 0.08. The 2002 acreage is about 110 less than in 1995. This is mainly due to the conversion of pasture to grass, food plots and shrub and tree plots. The credit value is 26.7 HUs. This is based on the 50 percent credit on existing habitat. This is about 19.5 more than in 1995, which is about 127 less than the projected HU figure of 154. The overall HSI increase was because of increases in reproduction, winter cover and winter food EOAs. A big part of this was the amount of pasture in 1995. Pasture, if mowed, provides limited nesting habitat. There is also little winter cover and food.
Whitstran	The 2002 results show a total of 1.7 HUs, with an overall HSI value of 0.1 applied to 16.3 acres. The HSI value in 1995 was 0.4. The 2002 acreage is about 6 acres lower than in 1995. This is mainly due to the total acreage difference between 1995 and 2002. Since the 2002 acreage is lower the figures were left alone. The credit value is 0.9 HUs. This is based on the 50 percent credit on existing habitat. This is 3.5 less than in 1995. The limiting factor at this site is the reproduction EOA. This is usually reflected in lower herbaceous cover and height.
Willow Bar	The 2002 results show a total of zero HUs, with an overall HSI value of zero applied to 0.7 acres. The HSI value in 1995 was 0.1. The 2002 acreage is much lower than in 1995. This is mainly due to the conversion of cropland to grass. The credit value is zero HUs. This is based on the 50 percent credit on existing habitat. This is 2 less than in 1995. Since the shrub plot fell outside of the unit, no value was given for reproduction and winter cover. The projected HU goal for this species is 24. With shrub development as planned, and development of shrub steppe habitat, this goal should be attainable for this site.

Windmill Ranch	The 2002 results show a total of 447.8 HUs, with an overall HSI value of 0.46 applied to 964 acres. The HSI value in 1995 was 0.2. The 2002 acreage is almost 300 higher than in 1995. This is reflected in the increases in annual forb, mesic shrub, palustrine emergent and scrub shrub cover types. The credit value is 224 HUs. This is based on the 50 percent credit on existing habitat. This is about 165 more than in 1995, which exceeds the projected HU figure of 145.

5.9 River Otter

Upper Pools, Lower Snake River	The 2001 results show a total of 4829 HUs, with an overall HSI value of 1.0 applied to 4829 acres. The HSI values in 1989 and 1958 were 0.4 and 0.24, respectively. The acreage in 2001 is the same as in 1989. The resulting HUs in 2001 were about 2839 higher than in 1989. This is about 3618 more than what was calculated in 1958. The increase in HSI from 1989 to 2001 is due to increased shoreline coverage with vegetation and lower distance to densite. The increase in shoreline cover is due to Indigobush (*Amorpha fruticosa*) expansion. The densite distance is related to cut banks and debris scattered along the shore.
Lower Pools, Lower Snake River	The 2001 results show a total of 2599 HUs, with an overall HSI value of 0.7 applied to 3738 acres. The HSI values in 1989 and 1958 were 0.68 and 0.69, respectively. The acreage in 2001 is the same as in 1989. The resulting HUs in 2001 were about 57.5 higher than in 1989. This is about 434 less than what was calculated in 1958.
Bailie Ranch	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Benton City	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Burma	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.

Campbell	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Central Ferry	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Couse Creek	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Donald Road	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Ferry Road	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Fisher Gulch	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Hartsock	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
John Henley	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Kelly Bar	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
McDonald Bridge	The 2002 results show a total of 3.2 HUs, with an overall HSI value of 0.58 applied to 5.4 acres. The HSI value in 1995 was 0.43. The 2002 acreage is the same as in 1995. The credit value is 1.6 HUs. This is based on the 50 percent credit on existing habitat. This is about 0.5 more than in 1995. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.

Mill Creek	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Naches	The 2002 results show a total of 6 HUs, with an overall HSI value of 0.89 applied to 7 acres. The HSI value in 1995 was 0.45. The 2002 acreage is the same as in 1995. The credit value is 3 HUs. This is based on the 50 percent credit on existing habitat. This is about 1.5 more than in 1995. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.
Nisqually John	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Pintler	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Revere Ranch	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Rice Bar	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Shumaker	The 2002 results show a total of 23.3 HUs, with an overall HSI value of 0.58 applied to 40 acres. The HSI value in 1995 was 0.55. The 2002 acreage is the same as in 1995. The credit value is 11.6 HUs. This is based on the 50 percent credit on existing habitat. This is about 0.7 more than in 1995.
Sulphur Creek	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.

Swank	The 2002 results show a total of 18.5 HUs, with an overall HSI value of 0.58 applied to 31.7 acres. The HSI value in 1995 was 0.45. The 2002 acreage is about 20 less than in 1995. This is mainly due to total acre differences between 1995 and 2002. This change was made since the shore75 acres in 1995 exceeded the total acres in 2002. The credit value is 9.3 HUs. This is based on the 50 percent credit on existing habitat. This is 2.3 less than what was recorded in 1995.
Swegle	The 2002 results show a total of 3.5 HUs, with an overall HSI value of 0.58 applied to 5.9 acres. The HSI value in 1995 was 0.43. The 2002 acreage is the same as in 1995. The credit value is 1.7 HUs. This is based on the 50 percent credit on existing habitat. This is about 0.5 more than in 1995.
Wallula HMU	The 2002 results show a total of 14.2 HUs, with an overall HSI value of 0.82 applied to 17.2 acres. The HSI value in 1995 was 0.45. The 2002 acreage is the same as in 1995. The credit value is 7.1 HUs. This is based on the 50 percent credit on existing habitat. This is about 2.1 more than in 1995. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.
Whitstran	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Willow Bar	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Windmill Ranch	No shore habitat for river otter is found on this site. No HSI data was collected, so the site provides no habitat value for this species.

5.10 Song Sparrow

Upper Pools, Lower Snake River	The 2001 results show a total of 717.5 HUs. The HSI values were 1.0 for mesic shrub and 0.85 for palustrine forest cover types. These were applied to 579 and 163.6 acres, respectively. The HSI values in 1989 were 1.0 and 0.97, respectively. The HSI values in 1958 were 1.0 and 0.95, respectively. The acreage in 2001 is about 157 higher than in 1989. This is reflected by increases in both mesic shrub and palustrine forest cover types. The resulting HUs in 2001 were about 136 higher than in 1989. This is about 561 less than what was calculated in 1958.
Lower Pools, Lower Snake River	The 2001 results show a total of 727.6 HUs. The HSI values were 1.0 for mesic shrub and 0.92 for palustrine forest cover types. These were applied to 170 and 280 acres, respectively. The HSI values in 1989 were 0.71 and 1.0, respectively. The HSI values in 1958 were 0.83 and 1.0, respectively. The acreage in 2001 is about 194 higher than in 1989. This is reflected by increases in both mesic shrub and palustrine forest cover types. The resulting HUs in 2001 were about 213 higher than in 1989. This is about 190 more than what was calculated in 1958.
Bailie Ranch	The 2002 results show a total of 108 HUs. The HSI values were 1.0 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 23.5 and 84.7 acres, respectively. When initial analysis of Bailie Ranch was done in 1995, no value was given to the existing habitat. The 2002 acreage is about 27 acres more than in 1995. This is reflected by increases in both mesic shrub and palustrine forest cover types. The credit value is 27 HUs. This is based on the positive change in acreage for song sparrow cover types between 1995 and 2002.

Benton City	The 2002 results show a total of 8 HUs. The HSI values were 0.7 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 4.8 and 4.6 acres, respectively. The HSI values in 1995 were 0.9 and 0.9, respectively. The acreage in 2002 is about 4.3 higher than in 1995. This is primarily seen in the conversion of grassland to mesic shrub. This is probably due to the natural expansion of canopy cover in the elm population that is scattered throughout this site. The credit value is 4 HUs. This is based on the 50 percent credit on existing habitat. This is about 1.7 more than in 1995.
Burma	The 2002 results show a total of 0.3 HUs. The HSI values were zero for mesic shrub (not present either year) and 0.9 for palustrine forest cover types. These were applied to zero and 0.3 acres respectively. The HSI values in 1995 were zero and 1.0 respectively. The acreage in 2002 is a little lower than in 1995. The credit value is 0.15 HUs. This is based on the 50 percent credit on existing habitat. This is about 0.1 less than in 1995.
Campbell	The 2002 results show a total of 31.4 HUs. The HSI values were 1.0 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 6.7 and 24.7 acres, respectively. The HSI values in 1995 were 0.9 and 0.9, respectively. The acreage in 2002 is about 44 higher than in 1995. This is primarily seen in the increase in palustrine forest acres. The credit value is 15.7 HUs. This is based on the 50 percent credit on existing habitat. This is about 3.4 more than in 1995.
Central Ferry	The 2002 results show a total of zero HUs. There was no mesic shrub or palustrine forest cover type in either 1995 or 2002. No change in value.

Couse Creek	The 2002 results show a total of 1.1 HUs. The HSI values were 0.97 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 0.6 and 0.5 acres respectively. The HSI values in 1995 were 0.5 and 0.8 respectively. The acreage in 2002 is about 0.2 less than in 1995. The credit value is 0.55 HUs. This is based on the 50 percent credit on existing habitat. This is slightly less than in 1995, which is also less than the projected HU figure of 0.7. It is difficult to pinpoint why HSIs were improved between 2002 and 1995. The 1995 data only presented the HSIs.
Donald Road	The 2002 results show a total of 43.6 HUs. The HSI values were 1.0 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 10.7 and 32.9 acres, respectively. The HSI values in 1995 were 0.9 and 0.9, respectively. The acreage in 2002 is about 4 higher than in 1995. This is primarily seen in the increase in both mesic shrub and palustrine forest acres. The credit value is 21.8 HUs. This is based on the 50 percent credit on existing habitat. This is about 4 more than in 1995.
Ferry Road	The 2002 results show a total of 2 HUs. The HSI values were 0.5 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 3.4 and 0.3 acres respectively. The HSI values in 1995 were zero and 0.9, respectively. The acreage in 2002 is about 2.9 higher than in 1995. This is primarily seen in the increase in mesic shrub acres. The credit value is 1.0 HUs. This is based on the 50 percent credit on existing habitat. This is about 0.6 more than in 1995. The shrub plantings at this site added mesic shrub where there was none in 1995.
Fisher Gulch	The 2002 results show a total of 131.6 HUs. The HSI values were 0.93 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 139 and 2.5 acres, respectively. The HSI values in 1995 were 0.9 and 0.9 respectively. The acreage in 2002 is about 30 higher than in 1995. This is primarily seen in the increase in mesic shrub acres. The credit value is 65.8 HUs. This is based on the 50 percent credit on existing habitat. This is about 16 more than in 1995.

Hartsock	The 2002 results show a total of 330 HUs. The HSI values were 1.0 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 255 and 75 acres respectively. The HSI values in 1995 were 0.5 and 0.9 respectively. The acreage in 2002 is about 8 higher than in 1995. This is primarily seen in the increase in mesic shrub acres. The credit value is 165 HUs. This is based on the 50 percent credit on existing habitat. This is about 65 more than in 1995, which is about 37 less than the projected HU figure of 202.
John Henley	The 2002 results show a total of 5.7 HUs. The HSI values were 0.7 for mesic shrub and 0.7 for palustrine forest cover types. These were applied to 7.8 and 0.3 acres, respectively. The HSI values in 1995 were 0.9 and zero, respectively. The acreage in 2002 is about 6 higher than in 1995, primarily seen in the increase in both mesic shrub and palustrine forest acres (there was no palustrine forest mapped in 1995). The credit value is 2.9 HUs, based on the 50-percent credit on existing habitat. This is about 2 more than in 1995, which is about 23 less than the projected HU figure of 26.
Kelly Bar	The 2002 results show a total of 33 HUs. The HSI values were 1.0 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 32 and 1.0 acres, respectively. The HSI values in 1995 were 0.9 and 0.9, respectively. The acreage in 2002 is about 11 higher than in 1995, primarily seen in the increase in mesic shrub acres. The credit value is 16.5 HUs, based on 50-percent credit on existing habitat. This is about 6.5 more than in 1995, which exceeds the projected HU figure of 14.
McDonald Bridge	The 2002 results show a total of 25 HUs. The HSI values were 0.15 for mesic shrub and 0.8 for palustrine forest cover types; and were applied to 3.6 and 31.5 acres, respectively. The HSI values in 1995 were 0.8 and 1.0, respectively. The acreage in 2002 is about 4 lower than in 1995. This is primarily seen in the decrease in palustrine forest acres. The credit value is 22.5 HUs. This is based on the 50-percent credit on existing habitat, about 7 less than in 1995. The low HSI for mesic shrub in 2002 was measurements from developed shrub plots. No natural mesic shrub was sampled.

Mill Creek	The 2002 results show a total of 4 HUs. The HSI values were 0.7 for mesic shrub cover type. Palustrine forest was not found on the site either year. This HSI was applied to 5.4 acres. The HSI values in 1995 were zero. The acreage in 2002 is about 5.4 higher than in 1995. This is primarily seen in the increase in mesic shrub acres from development. The credit value is 1.9 HUs. This is based on the 50 percent credit on existing habitat. This is about 1.9 more than in 1995, or about 9 less than the projected HU figure of 11. The zero HSI shown in 1995 occurred because there was no habitat.
Naches	The 2002 results show a total of 2.3 HUs. The HSI values were 0.8 for mesic shrub and 0.6 for palustrine forest cover types. These were applied to 1.2 and 2.2 acres, respectively. The HSI values in 1995 were zero and 0.9, respectively. The acreage in 2002 is about 0.7 higher than in 1995. This is primarily seen in the increase in mesic shrub acres (there was no mesic shrub in 1995). The credit value is 1.2 HUs. This is based on the 50 percent credit on existing habitat. This is about the same as in 1995.
Nisqually John	The 2002 results show a total of 264 HUs. The HSI values were 1.0 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 196 and 68 acres, respectively. The HSI values in 1995 were 0.9 and 0.9, respectively. The acreage in 2002 is about 88 higher than in 1995. This is primarily seen in the increase in mesic shrub acres. The credit value is 132 HUs. This is based on the 50 percent credit on existing habitat. This is about 52 more than in 1995, which exceeds the projected HU figure of 83.
Pintler	The 2002 results show a total of 149 HUs. The HSI values were 1.0 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 27 and 122 acres, respectively. The HSI values in 1995 were 0.9 and 0.9, respectively. The acreage in 2002 is about 55 higher than in 1995. This is primarily seen in the increase in both mesic shrub and palustrine forest acres. The credit value is 74.5 HUs. This is based on the 50 percent credit on existing habitat. This is about 32.5 more than in 1995, which exceeds the projected HU figure of 63.

Revere Ranch	The 2002 results show a total of 64.5 HUs. The HSI values were 0.75 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 75 and 8 acres respectively. The HSI values in 1995 were 0.9 and 0.9 respectively. The acreage in 2002 is about 56 higher than in 1995. This is primarily seen in the increase in mesic shrub acres. The credit value is 32.2 HUs. This is based on the 50 percent credit on existing habitat. This is about 21 more than in 1995, which is about 15 less than the projected HU figure of 47.
Rice Bar	The 2002 results show a total of 17 HUs. The HSI values were 1.0 for mesic shrub and 0.7 for palustrine forest cover types. These were applied to 17 and 0.6 acres, respectively. The HSI values in 1995 were 0.35 and 0.2, respectively. The acreage in 2002 is about 3 less than in 1995. This is primarily seen in the decrease in mesic shrub acres. There was no palustrine forest mapped in 1995. The credit value is 8.5 HUs. This is based on the 50 percent credit on existing habitat. This is about 5 more than in 1995, and about 30 less than the projected HU figure of 39. It is unclear why there is such a difference between mesic shrub HSIs. The field data in 2002 were generated through transects collected in 2001 that did not occur on Rice Bar. These sites may have been of higher quality than what is found currently on Rice Bar. An ocular estimate of mesic shrub at this site would indicate that the current mesic shrub is of high value which coincides with the high HSI presented above.
Shumaker	The 2002 results show a total of 167 HUs. The HSI values were 0.97 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 160 and 12 acres, respectively. The HSI values in 1995 were 0.9 and 0.9, respectively. The acreage in 2002 is about 63 lower than in 1995. This is primarily seen in the decrease in mesic shrub acres. The credit value is 83.5 HUs. This is based on the 50 percent credit on existing habitat. This is about 21 less than in 1995.

Sulphur Creek	The 2002 results show a total of 3.6 HUs. The HSI values were 0.22 for mesic shrub and 0.87 for palustrine forest cover types. These were applied to 16 and zero acres, respectively. The HSI values in 1995 were zero and 0.9, respectively. The acreage in 2002 is about 14 higher than in 1995. This is primarily seen in the increase in mesic shrub acres. Mesic shrub was not found in 1995. For 2002, palustrine forest was mapped as mesic shrub since the Russian olive mimics this more than palustrine forest. Shrubs were also planted on this site to further increase the amount of mesic shrub. The credit value is 1.8 HUs. This is based on the 50 percent credit on existing habitat. This is about 1.0 more than in 1995. The low HSI for mesic shrub in 2002 was from the measurements taken in developed shrub plots. No natural mesic shrub was sampled.
Swank	The 2002 results show a total of 6 HUs. The HSI values were 0.97 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 6 and zero acres, respectively. The HSI values in 1995 were 0.45 and 0.42, respectively. The acreage in 2002 is about 1.7 higher than in 1995. This is primarily seen in the increase in mesic shrub acres. The credit value is 3 HUs. This is based on the 50 percent credit on existing habitat. This is about 2 more than in 1995. The HSIs for Swank were obtained from Shumaker (across the river), so should be fairly representative. It is unclear why there is such a difference between mesic shrub and palustrine forest HSIs. The 1995 data gives only the HSIs so comparison is difficult.
Swegle	The 2002 results show a total of 28 HUs. The HSI values were 0.83 for mesic shrub and 0.68 for palustrine forest cover types. These were applied to 3.6 and 72 acres, respectively. The HSI values in 1995 were 0.83 and 1.0, respectively. The acreage in 2002 is about 3 lower than in 1995. This is primarily seen in the decrease in palustrine forest acres. The credit value is 14 HUs. This is based on the 50-percent credit on existing habitat. This is about 7.5 less than in 1995. It is unclear why there is such a difference between palustrine forest HSIs. The 1995 data gives only the HSIs so comparison is difficult.

Wallula HMU	The 2002 results show a total of 26.6 HUs. The HSI values were 0.7 for mesic shrub and 0.77 for palustrine forest cover types. These were applied to 34.5 and 2.8 acres, respectively. The HSI values in 1995 were zero and zero, respectively. The acreage in 2002 is about 37 higher than in 1995. This is mainly due to the conversion of pasture to grass, and shrub and tree plots (there was no mesic shrub or palustrine forest mapped in 1995). The credit value is 13.3 HUs. This is based on the 50 percent credit on existing habitat. This is about 13.3 more than in 1995, which is about 29.5 less than the projected HU figure of 43.
Whitstran	The 2002 results show a total of 1.5 HUs. The HSI values were 0.9 for mesic shrub and 0.88 for palustrine forest cover types. These were applied to 1.0 and 0.7 acres, respectively. The HSI values in 1995 were 0.9 and 0.9, respectively. The acreage in 2002 is about 1.5 lower than in 1995. This is primarily seen in the decrease in palustrine forest acres. The credit value is 0.8 HUs. This is based on the 50 percent credit on existing habitat. This is about 0.6 less than in 1995.
Willow Bar	The 2002 results show a total of zero HUs. There was no mesic shrub or palustrine forest cover type in either 1995 or 2002, and no change in value. The projected HU goal for this species is 1.5. With shrub development as planned, this goal should be attainable for this site.
Windmill Ranch	The 2002 results show a total of 29.3 HUs. The HSI values were 1.0 for mesic shrub and 1.0 for palustrine forest cover types. These were applied to 26.8 and 2.7 acres, respectively. The HSI values in 1995 were zero and 0.42, respectively. No HSI value for mesic shrub was given in USFWS, 1995. This cover type may not have been mapped prior to the data collection in 1995. The mapping in 2002 tended to map Russian olive as mesic shrub especially if it was located in scattered clumps away from the main riparian drainages. The acreage in 2002 is about 20 higher than in 1995. This is primarily seen in the increase in mesic shrub acres. The credit value is 14.6 HUs. This is based on the 50 percent credit on existing habitat. This is about 14 more than in 1995, which exceeds the projected HU figure of 1.5.

5.11 Western Meadowlark

Upper Pools, Lower Snake River	The 2001 results show a total of 4426.5 HUs, with an overall HSI value of 0.55 applied to 8105.5 acres. The HSI values in 1989 and 1958 were 0.52 and 0.35, respectively. The acreage in 2001 is about 200 higher than in 1989. This is mainly reflected by increases in shrub steppe cover types. The resulting HUs in 2001 were about 337 higher than in 1989. This is about 580 more than what was calculated in 1958. A big part of this is the increase in HSI value in grassland and shrub-steppe cover types between 1958 and 2001. Specifically, this was translated in an increase in herbaceous vegetation height and decrease in shrub cover.
Lower Pools, Lower Snake River	The 2001 results show a total of 2212.5 HUs, with an overall HSI value of 0.3 applied to 7619 acres. The HSI values in 1989 and 1958 were 0.32 and 0.34, respectively. The acreage in 2001 is about 540 less than in 1989. This is mainly reflected by decreases in grassland, and forb cover types. The resulting HUs in 2001 were about 390 less than in 1989. This is about 1800 less than what was calculated in 1958.
Bailie Ranch	The 2002 results show a total of 441 HUs, with an overall HSI value of 0.14 applied to 3143 acres. When initial analysis of Bailie Ranch was done in 1995, no value was given to the existing habitat. The 2002 acreage is about 340 acres less than in 1995. This is primarily seen in lower shrub steppe acres between 2002 and 1995. The credit value is 2.2 HUs. This is based on the positive change in acreage for western meadowlark cover types between 1995 and 2002.
Benton City	Benton City- The 2002 results show a total of 5.7 HUs, with an overall HSI value of 0.9 applied to 6.3 acres. The HSI value in 1995 was 0.73. The 2002 acreage is 4 lower than in 1995. This is primarily seen in the conversion of grassland to mesic shrub. The credit value is 2.8 HUs. This is based on the 50 percent credit on existing habitat. This is about one less than in 1995.

Burma	The 2002 results show a total of 0.04 HUs, with an overall HSI value of 0.12 applied to 0.3 acres. The HSI value in 1995 was 0.34. The 2002 acreage is 2.5 acres less than in 1995. This is due to the inability to determine the exact boundaries of the site. The maps and information in the letter supplement give little detail as to the real boundary of this PFA. The 2002 total acreage was much less than reported in 1995. Since the acres are less and no other corroborative data could be found, the data were left alone. The credit value is 0.02 HUs. This is based on the 50-percent credit on existing habitat. This is almost 0.42 HUs less than in 1995.
Campbell	The 2002 results show a total of 205 HUs, with an overall HSI value of 0.4 applied to 498 acres. The HSI value in 1995 was 0.34. The 2002 acreage is about 29 acres more than in 1995. This is mainly due to mapping differences between 2002 and 1995. In this case, the acreages were left as they were. The credit value is 103 HUs. This is based on the 50-percent credit on existing habitat. This is about 22 more than in 1995.
Central Ferry	The 2002 results show a total of 91.3 HUs, with an overall HSI value of 0.32 applied to 286 acres. The HSI value in 1995 was 0.16. The 2002 acreage is 185 acres more than in 1995. This is due to the conversion of pasture to grassland. The credit value is 45.6 HUs. This is based on the 50 percent credit on existing habitat. This is about 48 more than in 1995, which is about 67 less than the projected HU figure of 112. It is unclear why the HSI increased for between 1995 and 2002. The 1995 data gives only the HSIs so comparison is difficult. It could be attributed to cattle being removed from the site.
Couse Creek	The 2002 results show a total of 0.24 HU, with an overall HSI value of 0.24 applied to one acre. The HSI value in 1995 was 0.34. The 2002 acreage is slightly lower than that of 1995. The credit value is 0.12 HUs. This is based on the 50-percent credit on existing habitat. This is slightly less than in 1995.

Donald Road	The 2002 results show a total of 4 HUs, with an overall HSI value of 0.27 applied to 15 acres. The HSI value in 1995 was 0.26. The 2002 acreage is about 3 less than in 1995. This primarily seen in decreases of grassland, and increases in scrub shrub and forb habitats. The credit value is 2 HUs. This is based on the 50-percent credit on existing habitat. This is 0.3 less than in 1995.
Ferry Road	The 2002 results show a total of 32 HUs, with an overall HSI value of 0.75 applied to 42 acres. The HSI value in 1995 was 0.08. The 2002 acreage is slightly more than in 1995. The credit value is 16 HUs. This is based on the 50 percent credit on existing habitat. This is about 14.5 more than in 1995, which exceeds the projected HU figure of 8.5. It is suspected that the big increase in HSI value was due to increases in herbaceous height and percent of grass cover
Fisher Gulch	The 2002 results show a total of 693 HUs, with an overall HSI value of 0.54 applied to 1275 acres. The HSI value in 1995 was 0.34. The 2002 acreage is about 203 acres less than in 1995. This is primarily seen in increases in exposed rock and decreases in grassland acreage between 1995 and 2002. The credit value is 346.5 HUs. This is based on the 50 percent credit on existing habitat. This is 95 more than in 1995. It is suspected that the increase in HSI value was due to increases in herbaceous height and percent of grass cover.
Hartsock	The 2002 results show a total of 1080 HUs, with an overall HSI value of 0.5 applied to 2104 acres. The HSI value in 1995 was 0.16. The 2002 acreage is slightly less than in 1995. The credit value is 540 HUs. This is based on the 50-percent credit on existing habitat. This is about 370 more than in 1995, which exceeds the projected HU figure of 184. It is suspected that the big increase in HSI value was due to increases in herbaceous height and percent of grass cover.

John Henley	The 2002 results show a total of 157 HUs, with an overall HSI value of 0.23 applied to 677 acres. The HSI value in 1995 was 0.17. The 2002 acreage is about 175 acres more than in 1995. This is mainly attributed to the conversion of pasture and shrub steppe to grassland. The credit value is 78.5 HUs. This is based on the 50-percent credit on existing habitat. This is about 35 more than in 1995, which is about 57 less than the projected HU figure of 136.
Kelly Bar	The 2002 results show a total of 69.8 HUs, with an overall HSI value of 0.53 applied to 132 acres. The HSI value in 1995 was 0.2. The 2002 acreage is 65 acres less than in 1995. This is primarily seen in increase in exposed rock and decreases of total acreage between 1995 and 2002. The credit value is 34.9 HUs. This is based on the 50-percent credit on existing habitat. This is about 13 more than in 1995, which is slightly less than the projected HU figure of 35.3. It is suspected that the big increase in HSI value was due to increases in herbaceous height and percent of grass cover.
McDonald Bridge	McDonald Bridge- The 2002 results show a total of 22 HUs, with an overall HSI value of 0.66 applied to 34 acres. The HSI value in 1995 was 0.34. The 2002 acreage is 8 more than in 1995. This is primarily seen in the increase in grassland acreage between 1995 and 2002. The credit value is 11 HUs. This is based on the 50 percent credit on existing habitat. This is about 7 more than in 1995. It is suspected that the big increase in HSI value was due to increases in herbaceous height and percent of grass cover.

Mill Creek	The 2002 results show a total of 0.03 HUs, with an overall HSI value of 0.02 applied to 55 acres. The HSI value in 1995 was also 0.02. The 2002 acreage is 54 more than in 1995. This is due to the conversion of crop to grassland and mesic shrub. The credit value is 0.02 HUs. This is based on the 50-percent credit on existing habitat. This is about the same as in 1995. The low HSI values are due to the extreme height of the herbaceous vegetation.
Naches	The 2002 results show a total of 0.1 HUs, with an overall HSI value of 0.04 applied to 2.3 acres. The HSI value in 1995 was 0.34. The 2002 acreage is slightly higher than in 1995. The credit value is 0.05 HUs. This is based on the 50-percent credit on existing habitat. This is about 0.3 less than in 1995. It is unclear why the HSI decreased between 1995 and 2002. The 1995 data gives only the HSIs so comparison is difficult. The limiting factor in 2002 was the low height of the herbaceous vegetation.
Nisqually John	The 2002 results show a total of 592 HUs, with an overall HSI value of 0.27 applied to 2226 acres. The HSI value in 1995 was 0.33. The 2002 acreage is about 213 less than that of 1995. This is mainly due to the increase in exposed rock and subsequent loss of grassland between 1995 and 2002. The credit value is 296 HUs. This is based on the 50-percent credit on existing habitat. This is about 106 less than in 1995, and about 195 less than the projected HU figure of 491.
Pintler	The 2002 results show a total of 2543 HUs, with an overall HSI value of 0.64 applied to 3984 acres. The HSI value in 1995 was 0.4. The 2002 acreage is about 129 acres less than in 1995. This is mainly due to the increase in exposed rock and subsequent loss of grassland between 1995 and 2002. The credit value is 1271.6 HUs. This is based on the 50 percent credit on existing habitat. This is about 449 more than in 1995. The subtle increase in HSI could be attributed to the removal of cattle from the site.

Revere Ranch	The 2002 results show a total of 1147 HUs, with an overall HSI value of 0.63 applied to 1818 acres. The HSI value in 1995 was 0.17. The 2002 acreage is about 228 acres less than in 1995. This is mainly due to the increase in exposed rock and subsequent loss of grassland between 1995 and 2002. The credit value is 573.5 HUs. This is based on the 50-percent credit on existing habitat. This is about 400 more than in 1995, which exceeds the projected HU figure of 358. It is unclear why the HSI increased between 1995 and 2002. The 1995 data gives only the HSIs so comparison is difficult.
Rice Bar	The 2002 results show a total of 68.3 HUs, with an overall HSI value of 0.35 applied to 198 acres. The HSI value in 1995 was 0.16. The 2002 acreage is a 198 higher than in 1995. This is due to the conversion of crop and shrub steppe to grassland. The credit value is 34.2 HUs. This is based on the 50 percent credit on existing habitat. This is about 34.2 more than in 1995, and about 35 less than the projected HU figure of 79. It is unclear why the HSI increased for between 1995 and 2002. The 1995 data gives only the HSIs so comparison is difficult. It could be attributed to cattle being removed from the site.
Shumaker	The 2002 results show a total of 426 HUs, with an overall HSI value of 0.24 applied to 1757 acres. The HSI value in 1995 was 0.34. The 2002 acreage is about 52 more than that of 1995. This is mainly due to lower exposed rock and mesic shrub acres in 2002 and a subsequent increase in grassland acres. The credit value is 213 HUs. This is based on the 50-percent credit on existing habitat, and is about 77 less than in 1995. It is unclear why the HSI decreased for between 1995 and 2002. The 1995 data gives only the HSIs so comparison is difficult.

Sulphur Creek	The 2002 results show a total of 28.3 HUs, with an overall HSI value of 0.4 applied to 71 acres. The HSI value in 1995 was 0.24. The 2002 acreage is about 16 lower than in 1995. This is mainly due to the increase in mesic shrub acres and the subsequent loss of grassland acres in 2002. The credit value is 14.2 HUs. This is based on the 50 percent credit on existing habitat. This is 3.7 more than in 1995. It is unclear why the HSI increased for between 1995 and 2002. The 1995 data gives only the HSIs so comparison is difficult. It could be attributed to cattle being removed from the site.
Swank	The 2002 results show a total of 3.2 HUs, with an overall HSI value of 0.24 applied to 13.2 acres. The HSI value in 1995 was 0.34. The 2002 acreage is about 7 less than in 1995. The credit value is 1.6 HUs. This is based on the 50 percent credit on existing habitat. This is 2.4 less than in 1995.
Swegle	The 2002 results show a total of 22.2 HUs, with an overall HSI value of 0.6 applied to 37 acres. The HSI value in 1995 was 0.34. The 2002 acreage was about 3 higher than in 1995. The credit value is 11 HUs. This is based on the 50-percent credit on existing habitat. This is about 5 more than in 1995. It is unclear why the HSI increased for between 1995 and 2002. The 1995 data gives only the HSIs, so comparison is difficult.
Wallula HMU	The 2002 results show a total of 52.3 HUs, with an overall HSI value of 0.4 applied to 131 acres. The HSI value in 1995 was 0.33. The 2002 acreage is about 121 more than in 1995. This is mainly due to the conversion of pasture to grass, and shrub and tree plots. The credit value is 26 HUs. This is based on the 50 percent credit on existing habitat. This is 24.5 more than in 1995, which is about 40 less than the projected HU figure of 66 HUs.

Whitstran	The 2002 results show a total of 1.0 HUs, with an overall HSI value of 0.1 applied to 12.4 acres. The HSI value in 1995 was also 0.1. The 2002 acreage was 3.4 lower than in 1995. The credit value is 0.5 HUs. This is based on the 50 percent credit on existing habitat. This is about the same as those in 1995.
Willow Bar	The 2002 results show a total of 13.8 HUs, with an overall HSI value of 0.35 applied to 39.8 acres. The HSI value in 1995 was 0.16. The 2002 acreage is 39.8 higher than in 1995. This is mainly due to the conversion of cropland to grass. The credit value is 7 HUs. This is based on the 50 percent credit on existing habitat. This is 7 more than in 1995, which is about 6 less than the projected HU figure of 13. It is unclear why the HSI increased between 1995 and 2002. The 1995 data gives only the HSIs so comparison is difficult. It could be attributed to cattle being removed from the site. This site was also planted with wheatgrass, which improves the structure over cheatgrass.
Windmill Ranch	The 2002 results show a total of 418.4 HUs, with an overall HSI value of 0.46 applied to 1003 acres. The HSI value in 1995 was 0.26. The 2002 acreage is over 25 less than in 1995. This is reflected in the increases in shrub and emergent cover types and the loss of grassland. The credit value is 209.2 HUs. This is based on the 50 percent credit on existing habitat. This is about 87 more than in 1995, which is about 71 less than the projected HU figure of 280. It is unclear why the HSI increased between 1995 and 2002. The 1995 data gives only the HSIs so comparison is difficult. It could be attributed to cattle being removed from the site.

5.12 Yellow Warbler

Upper Pools, Lower Snake River	The 2001 results show a total of 220.7 HUs, with an overall HSI value of 0.76 applied to 291 acres. The HSI values in 1989 and 1958 were 0.67 and 0.55 respectively. The acreage in 2001 is about 100 higher than in 1989. The resulting HUs in 2001 were about 93 higher than in 1989. This is about 290 less than what was calculated in 1958. The increase in HSI from 1989 to 2001 was due to increases of deciduous cover and height of deciduous shrubs. This would be expected as willow scrub matures and expands over time.
Lower Pools, Lower Snake River	The 2001 results show a total of 283.2 HUs, with an overall HSI value of 0.93 applied to 306 acres. The HSI values in 1989 and 1958 were 0.77 and 0.78, respectively. The acreage in 2001 is about 129 more than in 1989. The resulting HUs in 2001 were about 147 more than in 1989. This is about 343 less than what was calculated in 1958. The increase in HSI from 1989 to 2001 was due to increases in deciduous cover percentage and height of deciduous shrubs. This would be expected as willow scrub matures and expands over time.
Bailie Ranch	The 2002 results show a total of 42.1 HUs, with an overall HSI value of 0.78 applied to 54 acres. When initial analysis of Bailie Ranch was done in 1995, no value was given to the existing habitat. The 2002 acreage is about 49 acres more than in 1995. The credit value is 38.2 HUs. This is based on the positive change in acreage for yellow warbler cover types between 1995 and 2002.
Benton City	The 2002 results show a total of 0.7 HUs, with an overall HSI value of 0.63 applied to 1.1 acres. The HSI value in 1995 was zero. The 2002 acreage is 0.6 more than in 1995. The credit value is 0.35 HUs. This is based on the 50 percent credit on existing habitat. This is about 0.35 more than in 1995. It is unclear why the HSI increased between 1995 and 2002. The 1995 data gives only the HSIs so comparison is difficult.

Burma	No palustrine scrub shrub habitat for yellow warbler is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Campbell	No palustrine scrub shrub habitat for yellow warbler is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Central Ferry	No palustrine scrub shrub habitat for yellow warbler is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Couse Creek	The 2002 results show a total of 0.15 HU, with an overall HSI value of 0.77 applied to 0.2 acre. The HSI value in 1995 was zero. The 2002 acreage is 0.2 higher than those in 1995 (no palustrine scrub shrub was mapped in 1995). The credit value is 0.08 HUs. This is based on the 50-percent credit on existing habitat. This is 0.07 more than in 1995.
Donald Road	The 2002 results show a total of 11.9 HUs, with an overall HSI value of 1.0 applied to 11.9 acres. The HSI value in 1995 was 0.9. The 2002 acreage is about 5.5 more than in 1995. The credit value is 6 HUs. This is based on the 50-percent credit on existing habitat. This is 3 more than in 1995.
Ferry Road	No palustrine scrub shrub habitat for yellow warbler is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
Fisher Gulch	The 2002 results show a total of 2 HUs, with an overall HSI value of 0.77 applied to 2.6 acres. The HSI value in 1995 was zero. The 2002 acreage is about 2.6 acres more than in 1995 (no palustrine scrub shrub was mapped in 1995). The credit value is 1.0 HU. This is based on the 50-percent credit on existing habitat. This is 1.0 more than in 1995.

Hartsock	The 2002 results show a total of 4.5 HUs, with an overall HSI value of 1.0 applied to 4.5 acres. The HSI value in 1995 was zero. The 2002 acreage is about 4.5 acres more than in 1995 (no palustrine scrub shrub was mapped in 1995). The credit value is 2.3 HUs. This is based on the 50-percent credit on existing habitat. This is 2.3 more than in 1995.
John Henley	No palustrine scrub shrub habitat for yellow warbler is found on this site, so the site provides no habitat value for this species. An HSI value was derived from field sampling at the site. It turned out that this palustrine scrub shrub plot fell outside of the boundary for this site.
Kelly Bar	No palustrine scrub shrub habitat for yellow warbler is found on this site. No HSI data was collected, so the site provides no habitat value for this species.
McDonald Bridge	The 2002 results show a total of 4.2 HUs, with an overall HSI value of 0.56 applied to 7.5 acres. The HSI value in 1995 was 0.8. The 2002 acreage is about 4.4 acres less than in 1995. This was due to losses from flooding in 1996. The credit value is 2.1 HUs. This is based on the 50-percent credit on existing habitat. This is almost 10 less than in 1995. It is unclear why the HSI decreased for 1995 to 2002. The 1995 data gives only the HSIs so comparison is difficult. River flooding in 1996 could be attributed to the degradation of habitat.
Mill Creek	No palustrine scrub shrub habitat for yellow warbler is found on this site. No HSI data was collected, so the site provides no habitat value for this species. An HSI value was derived from field sampling at the site.
Naches	The 2002 results show a total of 0.53 HUs, with an overall HSI value of 0.56 applied to 0.95 acres. The HSI value in 1995 was 0.85. The 2002 acreage is 0.75 lower than in 1995. The credit value is 0.3 HUs. This is based on the 50 percent credit on existing habitat. This is about 0.4 less than in 1995.

Nisqually John	No palustrine scrub shrub habitat for yellow warbler is found on this site. No HSI data was collected, so the site provides no habitat value for this species. An HSI value was derived from field sampling at the site.
Pintler	No palustrine scrub shrub habitat for yellow warbler is found on this site. No HSI data was collected, so the site provides no habitat value for this species. An HSI value was derived from field sampling at the site.
Revere Ranch	The 2002 results show a total of 5.1 HUs, with an overall HSI value of 1.0 applied to 5.1 acres. The HSI value in 1995 was 0.9. The 2002 acreage is about the same as in 1995. The credit value is 2.6 HUs. This is based on the 50 percent credit on existing habitat. This is about 0.3 more than in 1995, and about 6 less than the projected HU figure of 8.6.
Rice Bar	No palustrine scrub shrub habitat for yellow warbler is found on this site. No HSI data was collected, so the site provides no habitat value for this species. An HSI value was derived from field sampling at the site.
Shumaker	The 2002 results show a total of 3.2 HUs, with an overall HSI value of 0.77 applied to 4 acres. The HSI value in 1995 was zero. The 2002 acreage is about 4 more than that of 1995 (no palustrine scrub shrub was mapped in 1995). The credit value is 1.6 HUs. This is based on the 50 percent credit on existing habitat. This is about 1.6 more than in 1995.
Sulphur Creek	The 2002 results show a total of 1.0 HU, with an overall HSI value of 1.0 applied to 1.0 acre. The HSI value in 1995 was zero. The 2002 acreage is about 1.0 more than in 1995 (no palustrine scrub shrub was mapped in 1995). The credit value is 0.5 HU. This is based on the 50 percent credit on existing habitat. This is 0.5 more than in 1995.

Swank	No palustrine scrub shrub habitat for yellow warbler is found on this site. No HSI data was collected, so the site provides no habitat value for this species. An HSI value was derived from field sampling at the site.
Swegle	The 2002 results show a total of 2.6 HUs, with an overall HSI value of 0.45 applied to 6 acres. The HSI value in 1995 was zero. The 2002 acreage is about 2.7 more than in 1995. The credit value is 1.3 HU. This is based on the 50 percent credit on existing habitat. This is 0.4 more than in 1995. No HSI was given in the USFWS, 1995. This area may not have had palustrine scrub shrub habitat mapped at the time of the 1995 survey.
Wallula HMU	The 2002 results show a total of 0.9 HUs, with an overall HSI value of 0.56 applied to 1.6 acres. The HSI value in 1995 was 0.77. The 2002 acreage is about 5.9 less than in 1995. The credit value is 0.45 HU. This is based on the 50 percent credit on existing habitat. This is 2.4 less than in 1995, which is about 2.6 less than the projected HU figure of 3.1.
Whitstran	The 2002 results show a total of 2 HUs, with an overall HSI value of 1.0 applied to 2 acres. The HSI value in 1995 was 0.64. The 2002 acreage is about 0.2 more than in 1995. The credit value is 1.0 HU. This is based on the 50 percent credit on existing habitat. This is 0.4 more than in 1995. It is unclear why the HSI increased for 1995 to 2002. The 1995 data gives only the HSIs so comparison is difficult.
Willow Bar	No palustrine scrub shrub habitat for yellow warbler is found on this site. No HSI data was collected, so the site provides no habitat value for this species. An HSI value was derived from field sampling at the site.

Windmill Ranch	The 2002 results show a total of 51.7 HUs, with an overall HSI value of 0.86 applied to 60.4 acres. The HSI value in 1995 was 0.67. The 2002 acreage is about 42 more than in 1995. The credit value is 25.8 HU. This is based on the 50 percent credit on existing habitat. This is 19.8 more than in 1995, which exceeds the projected HU figure of 18.3. It is unclear why the HSI decreased from 1995 to 2002. The 1995 data gives only the HSIs so comparison is difficult. This could be attributed to the removal of cattle from riparian areas.

6.0 Discussion/Recommendations

6.1 California Quail

Lower Snake River	California quail made gained over 5000 HUs on the lower Snake River since 1989. Acreage figures were about the same, so the gains were reflected in higher HSI values, particularly on the lower section. This occurred because of higher food, cover, and roost LRSI values. This would be expected as trees and shrubs continued to mature over the 12 years between the investigations.
XYZ Lands	California quail again made huge gains compared to the base condition in 1995, gaining over 2500 HUs. Most of the gains were at Shumaker (600 more than in 1995), Windmill Ranch (375), Revere Ranch (275), Pintler (600), and Nisqually John (250). All five of these sites had lower total habitat acres with improved HSIs. Since California quail covers many different cover types, gains and losses can be made through cover type conversion. For California quail, grassland is a huge amount of the total habitat acreage within the XYZ lands. Much of this acreage difference is attributable to mapping differences, where grassland is remapped as exposed rock.
All Lands	Even with the large gains, Comp Plan lands are still 12,400 HUs short of the 1958 baseline. With continued habitat maturity and more shrub and tree developments/enhancements, this deficit could be reduced substantially.

6.2 Canada Goose

Lower Snake River	Canada goose habitat made significant gains on the lower Snake River by increasing almost 900 HUs since 1989. Acreage figures were the same, so the gains were reflected in higher HSI values on the upper section. This occurred because of higher nesting habitat SI values on the upper pools. Brood habitat was slightly lower in 2001 compared to 1989. The number of nesting tubs and distribution reflects the increase in HUs.
XYZ Lands	Bailie Ranch, Benton City, Ferry Road, Naches, Revere Ranch, Sulphur Creek, Swank, and Windmill Ranch were measured for Canada goose habitat. Benton City, Ferry Road, Naches, Sulphur Creek, Swank, and Windmill Ranch were not measured in 1995. The gains in habitat were meager, with a total of 18 HUs for all sites. The sites were added, since they had potential habitat cited by the USFWS in 1995. Only Ferry Road exhibited any quality habitat for this species.
All Lands	Even with the large gains, Comp Plan lands are still 1228 HUs short of the 1958 baseline. Additional habitat and HUs can be achieved with additional nesting structures and management for brood habitat. This becomes a problem on the lower Snake River due to the domestication of wild geese and their subsequent use of riverside parklands. The State HMAs could be improved to handle a few more nesting geese, since they are isolated parcels away from urban areas. The HMAs listed above could be improved to maximize habitat for geese. Even with these improvements, it is unlikely that the HU goal of 3896 will be reached.

6.3 Chukar

Lower Snake River

Chukar partridge habitat made a slight gain on the lower Snake River by increasing about 448 HUs since 1989. Acreage figures in 2001were 216 higher than in 1989. The gains were mainly on the upper pools. The HSIs were the same on the lower pools (0.01), and only just slightly higher on the upper pools in 2001 (0.8 versus 0.79 in 1989). The acreage increase on the upper pools was seen in the mesic shrub and shrub-steppe cover types.

XYZ Lands

Chukar partridge made huge gains compared to the base condition in 1995, gaining almost 2500 HUs. Most of the gains were at Shumaker (285 more than in 1995), Fisher Gulch (212), Windmill Ranch (140), Revere Ranch (400), Hartsock (750), and John Henley (292). There were only 9 less total habitat acres in 2002 than in 1995. The gain in HUs was achieved through improved HSIs. It is difficult to pinpoint where the gains came from since all variables were fairly high. Exposed rock was mapped more carefully in 2002, so some sites that did not have exposed rock in 1995 had exposed rock in 2002. In general, exposed rock and mesic shrub acres were greater in 2002.

All Lands

The current HU balance for all lands is 5069 greater than the 1958 base line. This should remain fairly stable into the future. No specific management is needed for this species.

6.4 Downy Woodpecker

Lower Snake River

Downy Woodpecker made modest gains on the lower Snake River, by increasing over 111 HUs since 1989. The palustrine forest acreage increased over 213 from 1989, and the HSIs were also higher. This was reflected in higher basal area and snag numbers. This would be expected as trees and shrubs continued to mature over the 12 years between the investigations.

XYZ Lands	Downy Woodpecker actually lost HUs compared to the base condition in 1995, losing about 39 HUs. There were 45 fewer acres of palustrine forest habitat in 2002 compared to 1995. The HSIs varied from site to site. Some sites showed improvement where others showed declines.
All Lands	Even with the gain, Comp Plan lands are still 526 HUs short of the 1958 baseline. With continued habitat maturity and more riparian forest developments/enhancements, this deficit could be reduced substantially.

6.5 Mallard

Lower Snake River	Mallard habitat on the lower Snake River has lost over 45 HUs since 1989. Acreage figures were the same, so the losses were reflected in lower HSI values. The big reason for this loss is the human disturbance variable. Regionally, the human population has been growing, and this is reflected in more boat use and recreation on the lands adjacent to the Snake River.
XYZ Lands	Mallard habitat made a slight gain compared to the 1995 base condition 1995, increasing over 8 HUs. Habitat increased about 55 acres, primarily due to mapping updates. The HSIs were generally lower in 2002 than in 1995.

All Lands

In 1989, the lower Snake River Comp Plan lands registered a surplus in mallard habitat. Now the data shows a 24.2 HU deficit. The lower Snake River actually showed improvements in shoreline cover but, with the human disturbance variable, it will be difficult to gain any additional HUs on the lower Snake River. There is some potential to improve habitat on the off-project HMAs. These sites are isolated from regional urban centers to a certain degree, and only a few of them (Windmill Ranch, Revere Ranch, and Bailie Ranch) lend themselves to mallard management. Donald Road, Hartsock, and Whitstran have probably reached their development peak. Bailie Ranch showed a positive acreage change, but this was not counted since it was probably a mapping difference. Unless credit can be received for mallard developments at Bailie Ranch, it will never count toward Comp Plan goals. This leaves only Windmill Ranch and Revere Ranch as suitable sites for mallard habitat work. Enough gains could be made on these sites to offset losses on the Snake River.

6.6 Marsh Wren

Lower Snake River

Marsh Wren made significant gains on the lower Snake River, gaining over 58 HUs since 1989. The palustrine emergent acreage increased about 248 from 1989 to 2001, but HSI values actually dropped a little over the same period of time. This is probably due to the invasion of exotic species like giant reed (*Phragmites* spp.) and reed canary grass (*Phalaris arundinacea*).

XYZ Lands

Marsh Wren again made gains compared to the 1995 base condition, increasing over 15 HUs. The acreage of palustrine emergent habitat increased by 121 from 1995 to 2002. The HSIs were also generally higher in 2002 compared to 1995 figures.

All Lands

With the additional gains on both the lower Snake River and the XYZ lands, the surplus over the 1958 baseline increased to 108.4 HUs. As the Snake River continues to adjust to new flow regimes for anadromous fish passage, the acreage of palustrine emergent habitat should continue to expand. There are threats to the existing habitat, however; primarily in the form of exotic plants. Purple loosestrife (*Lythrum salicaria*) continues to invade the lower Snake River, but has not established a significant foothold yet. Although giant reed and reed canary grass provide some habitat value for the marsh wren, it is a lower quality habitat compared to the native tules. Management will be directed at curbing the spread of exotics, and especially purple loosestrife. Indigobush is another threat to palustrine emergent habitat, and should be monitored and addressed as needed.

6.7 Mule Deer

Lower Snake River

Mule Deer habitat on the lower Snake River has lost over 346 HUs since 1989. Acreage figures in 2001 were over 238 higher than in 1989. The HSI values were similar on the upper river, but had declined on the lower river from 1989 to 2001. The lower HSIs were found on the grassland and shrub-steppe cover types. This is reflected in lower shrub coverage between 1989 and 2001. Wildfires are frequent occurrences along the lower Snake River. Much of the existing shrub cover has been removed by fire. Conversely, the mesic shrub and palustrine forest cover types have improved HSI values from 1989 to 2001. The developed HMUs are providing most of the high quality deer habitat found on the lower river.

XYZ Lands

Mule Deer made gains compared to the 1995 base condition, increasing over 457 HUs. The acreage of mule deer habitat decreased by 101 from 1995 to 2002. The HSIs were generally the same or higher in 2002 compared to 1995 figures.

All Lands	Even with the losses on the lower Snake River, the Comp Plan lands have a surplus of 489 HUs over the 1958 baseline. This habitat is still at risk to fire, but generally should not decline if cattle are still excluded from Comp Plan lands. Noxious weeds pose another threat, and should be monitored and addressed as necessary.

6.8 Ring-Necked Pheasant

Lower Snake River	Ring-necked pheasant made significant gains on the lower Snake River, increasing about 1280 HUs since 1989. Acreage figures increased by 716 from 1989 to 2001, and HSI values also improved during that time period. Most of the acreage gains were in shrub/shrub steppe and forest cover types. This would be expected, as trees and shrubs continued to mature over the 12 years between investigations. Winter cover was the limiting factor on the lower pools. Reproduction and winter food were equal limiting factors on the upper pools.
XYZ Lands	Ring-necked pheasant again made slight gains compared to the 1995 base condition, gaining over 147 HUs. Acreage figures in 2002 were 246 lower than found in 1995. The HSIs were mixed from site to site. The largest gains came from Windmill Ranch (165), Bailie Ranch (66), Hartsock (48), and Pintler (40). Conversely, Nisqually John registered the biggest loss (184). The limiting factor for most sites was habitat for reproduction, while winter cover limited a few others.

All Lands	Even with the gains, the Comp Plan lands are still 2266 HUs short of the 1958 baseline. The Grassland cover type is not included in these calculations. It is felt that tall wheatgrass (*Agropyron* spp.) provides the structure for good reproductive habitat, if it is undisturbed during nesting season. Native shrub steppe will provide good reproduction if wheatgrass and/or fescue is the predominant herbaceous cover. The wheatgrass also provides good winter cover. Tall wheatgrass plantings should be typed as unmowed pasture. To improve habitat under the existing model, management should be focused on improving shrub steppe habitat, working toward a native condition. Shrub steppe habitat should be expanded where possible. Expansion of shrub and tree plantings will also improve habitat for this species.

6.9 River Otter

Lower Snake River	River otter made modest gains on the lower Snake River, increasing almost 3000 HUs since 1989. All of this occurred on the upper pools, since the HSIs on the lower pools were relatively unchanged. Acreage figures were the same, so gains were reflected in higher HSI values. Den site distance was the area of highest SI improvement, going from 0.1 in 1989 to 1.0 in 2001 on the upper pools. As shorelines along the reservoirs aged, woody debris and vegetative cover washed up or became established. Much of the woody cover is associated with the expansion of indigobush in the region.
XYZ Lands	River otter again made modest gains compared to the 1995 base condition, increasing 4 HUs. Acreage was reduced somewhat from 1995 to 2002. The HSI were higher on all sites inventoried.

All Lands

With the additional gains on both lower Snake River and XYZ lands, the surplus over the 1958 baseline increased to 3215 HUs. Conditions on the Snake River and XYZ lands should remain fairly stable for the foreseeable future. No specific management is needed for this species.

6.10 Song Sparrow

Lower Snake River

Song sparrow made modest gains on the lower Snake River by increasing almost 349 HUs since 1989. Acreage increased by over 354 from 1989 to 2001. Gains were made in both the mesic shrub and palustrine forest cover types. This would be expected, as trees and shrubs continued to mature over the 12 years between the investigations. The HSI values remained high from 1989 to 2001. Palustrine forest HSI dropped a little on both the upper and lower pools; while mesic shrub improved a little on the lower pools.

XYZ Lands

Song sparrow also made modest gains compared to the 1995 base condition, increasing over 232 HUs. Total acreage also increased by almost 305 from 1995 to 2002. These gains were from mesic shrub. Palustrine forest actually lost about 45 acres from 1995 to 2002. The HSIs were generally higher at most sites in 2002, with only a few exceptions. Sulphur Creek and McDonald Bridge were the only sites with significantly lower mesic shrub HSIs. The main reason for this is the fact that shrub cover percentages were under 10. The data from Sulphur Creek and McDonald Bridge were obtained from developed shrub plots. In actuality, these areas should be cover typed as grassland or forbland until shrub cover exceeds 10 percent. These were left alone since these plots were developed for these sites.

All Lands

With the gains, Comp Plan lands now have a surplus of 343 HUs compared to the 1958 baseline. This surplus should increase as shrub plots expand. Management for downy woodpecker will also benefit song sparrow in the short term.

6.11 Western Meadowlark

Lower Snake River	Western meadowlark habitat on the lower Snake River has lost almost 50 HUs since 1989. Acreage figures in 2001 were almost 340 lower than in 1989. The HSI values were slightly higher on the upper river, but had declined slightly on the lower river from 1989 to 2001. The shrub-steppe HSIs were higher in 2001 compared to 1989 on both reaches. The grassland HSI was significantly lower in 2001 on the lower pools.
XYZ Lands	Western meadowlark made significant gains as compared to the base condition in 1995, increasing over 1421 HUs. Total acreage also decreased by almost 500 from 1995 to 2002. Mapping differences caused most of this acreage loss. Exposed rock acreage increased, while grassland and shrub steppe acres were reduced. The HSIs were generally higher on the XYZ lands in 2002, compared to 1995 figures. Most of the gains were at Hartsock (370 more than in 1995), Windmill Ranch (87), Revere Ranch (400), Pintler (449), and Fisher Gulch (95).
All Lands	With the gains, Comp Plan lands now have a surplus of 2600 HUs compared to the 1958 baseline. Native shrub-steppe health is the key to this species habitat needs. Management should be focused on improving shrub steppe habitat by working toward the native condition. Shrub-steppe habitat should be expanded where possible.

6.12 Yellow Warbler

Lower Snake River	Yellow warbler made significant gains on the lower Snake River, increasing over 240 HUs since 1989. Palustrine scrub shrub acreage also increased over the same period, gaining almost 229. The HSIs were improved on both pools in 2001 compared to the 1989 figures. The increase in HSI from 1989 to 2001 was due to increases of deciduous cover and height of deciduous shrubs. This would be expected as willow scrub matures and expands over time.

XYZ Lands	Yellow warbler made significant gains on the XYZ lands by increasing over 62 HUs since 1995. Palustrine scrub shrub acreage also increased almost 103 HUs over the same period. The HSIs were generally improved overall in 2002 compared to the 1995 figures. Some sites had declines in HSIs, but the majority showed improvement. The largest gains were made at Bailie Ranch (38) and Windmill Ranch (25.8). The gains at Bailie Ranch are somewhat suspect, since it is unclear whether there was habitat expansion or whether the change is due to mapping differences. Updated mapping at Bailie Ranch was based on field notes and interpretation of the aerial photography.
All Lands	Even with the gains, Comp Plan lands are still almost 550 HUs short of the 1958 baseline. This species above all others represent the native riparian shrub/forest complex. This species and others in its guild are drawn to the native poplar/willow communities. Russian olive-dominated riparian communities do not provide the food and structure sought out by this warbler. With continued habitat maturity and more native riparian shrub and tree developments/enhancements, this number could be reduced substantially.

7.0 Conclusions

The results of this investigation are in no way precise. There was much effort put into the fieldwork and model calculations. The cover type acres were derived from what already existed in the original GIS datasets, except for the 2002 XYZ lands. When it came time to use the cover types and compare from one year to the next, it was found that yearly totals for each study area did not match exactly. The lower Snake River cover types used for current condition (1989) in the 1991 Report were pared down to match the coverage of the 1958 photography. When the other areas of the lower Snake River were added, the cover types were close, but varied some from year to year. There are many questions that could be raised on the cover type mapping for this project. For purposes of this report, the HUs generated as the 1958 baseline will stand as the baseline used for this investigation. With that said, the current condition should be a good representation of the total number of HUs present on the lower Snake River Comp Plan lands today. Looking at only the lower Snake River lands (the basis of the 1991 Report), today there are 10 of the 12 species showing an HU deficit compared to the 1958 baseline. When the XYZ lands are added in, only six species have an HU

deficit: California quail, Canada goose, downy woodpecker, mallard, ring-necked pheasant, and yellow warbler. Chukar partridge and river otter, which already have surplus HUs, do not need any specific management at this time. All others have potential for management to improve their HU numbers.

Of the six species having an HU deficit, the ones needing the most management effort initially are the downy woodpecker and yellow warbler. These two species rely on habitat that takes years to establish and mature to adequate levels. The development of the palustrine forest and palustrine scrub shrub habitat will not only benefit the woodpecker and warbler, but also the quail and pheasant HUs. As mentioned earlier, Canada goose and mallard will not realize significant gains on the lower Snake River due to management and use conflicts. The best options for these latter two species are on the XYZ lands off the Snake River.

8.0 References

Hitchcock and Cronquist, 1976, Flora of the Pacific Northwest, University of Washington Press, Seattle, 730 pgs.

Sather-Blair, Christianson and Ross, et al, 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.

Corps (U.S. Army Corps of Engineers), 2002, "Final Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement: Appendix L, Lower Snake River Mitigation History and Status", U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 33 pgs plus Annexes.

Corps, 1994, 1995, 2001, "Design Memorandum 6: Wildlife Compensation and Fishing Access Selection: XYZ Lands Letter Supplements 1-5, 7-25, 27," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington.

Corps, 1983, "Special Report: Lower Snake River Fish and Wildlife Compensation Plan," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 95 pgs.

Corps, 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.

Corps, 1979b, "Design Memorandum 2A: Wildlife Compensation and Fishing Access," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 10 pgs.

Corps, 1979c, "Design Memorandum 6: Wildlife Compensation and Fishing Access Selection," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 36 pgs.

Corps, 1975, "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.

Corps, 1975, "Design Memorandum for Wildlife Habitat Development: Lower Snake River Project," U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington, 125 pgs.

USFWS (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.

U.S. Fish and Wildlife Service, 1980, "Habitat Evaluation Procedure," Ecological Services Manual 102, Washington D.C.