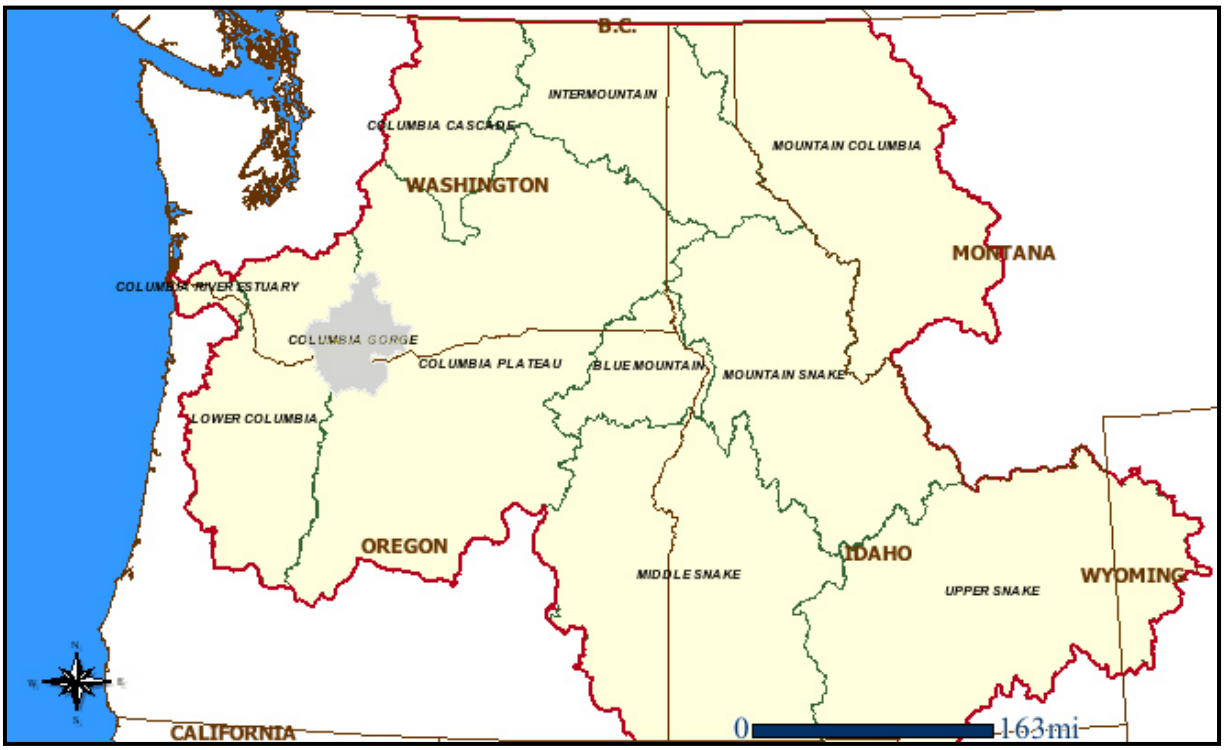
U.S. Fish and Wildlife Service - Pacific Region

Columbia River Basin Hatchery Review Team

Columbia River Basin, Columbia Gorge Province

Little White Salmon, Big White Salmon, and Wind River Watersheds



Carson, Spring Creek, Little White Salmon, and Willard National Fish Hatcheries

Assessments and Recommendations

Final Report, Appendix A:

All-H Analyzer (AHA) Output for Salmon and Steelhead Stocks

December 2007

Appendix A: All-H Analyzer (AHA) Output for Salmon and Steelhead Stocks Carson, Spring Creek, and Little White Salmon National Fish Hatcheries, including natural populations in the Wind, Big White Salmon, and Little White Salmon Rivers.

What is AHA?

AHA is an *Excel*-based spreadsheet simulation model that quantifies the mean number of adults returning to a watershed after many generations (years) of reproduction and migration based on equilibrium, or near equilibrium, conditions. Recent versions of AHA (Versions 6.x and 7.x) for the Columbia River allocate returning adults to six physical geographic locations: (1) a hatchery and other recapture facilities within the watershed under consideration; (2) the natural habitat within the watershed where adults spawn; (3) marine harvest areas; (4) the lower Columbia River mainstem downstream from Bonneville Dam; (5) the upper Columbia River mainstem upstream from Bonneville Dam, and (6) a terminal harvest area in the watershed where adults return to spawn. The model was developed primarily by Lars Mobrand (Mobrand Biometrics), in collaboration with the Washington Department of Fish and Wildlife (WDFW) and the Northwest Indian Fisheries Commission (NWIFC), as part of the HSRG review[1] of salmon and steelhead hatcheries in Puget Sound and coastal Washington state.

AHA is based on the Beverton-Holt spawner-recruit model where habitat *capacity* represents the maximum number of adult recruits (asymptote of the Beverton-Holt curve) that the habitat can produce and return to a watershed, and *productivity* represents the slope of the spawner-recruit curve at the origin (i.e., the number of adult recruits per adult spawner [*R/S*] when the number of adult spawners is very low and density-dependent factors or competition can be ignored). The actual model (spreadsheet) consists of several sheets (e.g. natural component sheet, hatchery component sheet, genetic fitness sheet, etc.) where estimated mean values of biological and population dynamic parameters are provided by the user (e.g. mean fecundity of females, estimated egg-to-smolt survival, etc.). The genetic fitness function is based on the model of Ford (2002)[2] and allows the mean fitness of a population (productivity) to decrease incrementally over time depending on (a) the mean proportion of natural spawners composed of hatchery-origin adults (*pHOS*) relative to the mean proportion of the hatchery broodstock composed of natural-origin adults (*pNOB*), and (b) the number of generations that hatchery-origin fish spawn naturally in the watershed. The model is currently being used by fishery comanagers in the Pacific Northwest as a "planning tool" to (a) document assumptions and goals (e.g. current and future habitat conditions, respectively) and (b) assess the likelihood that harvest and conservation goals can be achieved given the aforementioned assumptions and desired future conditions. Only those scenarios achieving realistic or desired outcomes are

[1] www.hatcheryreform.org

[2] *Ford, M.J. 2002. Selection in captivity during supportive breeding may reduce fitness in the wild. Conservation Biology 16: 815-825.*

considered valid. For example, any scenario that results in extirpation of a stock is considered invalid, where any or all of the four H's[3] can contribute to stock extirpation.

For more detail on AHA, see AHA Technical Discussion Paper on the Publications page of www.hatcheryreform.org. An AHA user's guide and all AHA analyses are available from the AHA section of the prototype Managing for Success web site at www.mobrand.com/mfs (log in with user name and password "public"). The AHA User's Guide is also available at www.fws.gov/pacific/fisheries/hatcheryreview/reports.html/.

Explanation of Tables A1-A7[4]

Information in the following tables (Tables A1-A7) is intended to provide a summary "snapshot" of the predicted future outcomes associated with current hatchery programs and alternatives considered by the Review Team. Seven sets of simulations are presented: (1) spring Chinook in the Wind River including Carson NFH spring Chinook; (2) summer steelhead in the Wind River including two hatchery program "alternatives"; (3) fall Chinook in the Wind River (current conditions only); (4) tule fall Chinook at Spring Creek NFH and in the Big White Salmon River after removal of Condit Dam; (5) spring Chinook at Little White Salmon NFH and in the Little White Salmon River; and (6) spring Chinook in the Big White Salmon after removal of Condit Dam, and (7) *upriver bright* (URB) fall Chinook at Little White Salmon NFH and in the Little White Salmon River.

Output of AHA is displayed in a series of colored bar graphs representing adult fish (recruits). Solid green represents natural-origin fish; solid pink represents hatchery-origin fish. Pink diagonal hash bars represent hatchery-origin fish in excess of comanager goals, and gray vertical bars represent hatchery-origin fish that have been selected at least one generation in the natural environment (e.g. as occurs in a genetically-integrated hatchery program).

The graph in the lower-left portion of each table shows the realized mean values of *pNOB* and *pHOS* (mean proportions of the hatchery broodstock and natural spawners composed of natural-origin adults and hatchery-origin adults, respectively). The diagonal lines represent combination values of *pNOB* and *pHOS* that yield the same value of the parameter, *PNI*, which stands for *proportional natural influence,* where $PNI = pNOB/(pNOB + pHOS)$. *PNI* varies from 0.0 to 1.0 and represents the relative degree to which the genetic constitutions of hatchery-origin fish and/or natural-origin fish are influenced by the natural environment versus the hatchery environment. When $pHOS = 0.0$ and $pNOB > 0.0$, then $PNI = 1.0$ and the genetic constitution of natural-origin fish will be determined by the natural environment only. (Note: In practice, *pNOB* must be greater than 0.1 to overcome random genetic effects and single-generation selection effects of the hatchery; otherwise, hatchery fish will essentially represent a "hatchery stock" genetically regardless of the value of *pHOS* .) When *pHOS = pNOB,* then the hatchery and natural environments will have equal influence on the genetic

[3] *Habitat, Harvest, Hydropower effects, Hatchery program effects.*

[4] *Parameter estimates used to generate the following tables have not all been verified and should be considered preliminary. However, their values are based on the best information available, and the general results presented in the following tables are not expected to change significantly as the parameter estimates are verified and updated.*

constitutions of both hatchery and wild fish, and *PNI* = 0.5. For integrated hatchery populations and natural stocks, the goal is for *PNI* to be greater than 0.5 and as close to 1.0 as possible (e.g., > 0.67) as a long-term goal. Symbols on the *PNI* graph correspond with each of the current and alternative scenarios shown as bar graphs (see also the *Components of this Report* section for definitions of biological significance, population viability, habitat, and harvest ratings).

The outputs presented in Tables A1-A7 are intended to be viewed as part of an electronic report via a desktop computer where portions of the tables can be zoomed in and out for clarity. The Review Team acknowledges that they are difficult to read as printed paper copies.

The data files and specific version of AHA (V.7.2.4) used to generate the outputs in Tables A1-A7 are available upon request form the Chair of the Hatchery Review Team. Some familiarity with AHA is required, and expected, before implementing the software.

Table A1. AHA output for spring Chinook in Wind River, including Carson NFH spring Chinook. See report for descriptions of Alternatives.

All H Analyzer (AHA) — *Activate Scenario Documentation ------->*

Version 7.2.4

July 31, 2007

	Current	No Hatchery	Alternatives 1 + 5	Long-Term Goal (15+ years)	Goal + 33%? term. Harvest
Biological Significance:	LOW	LOW PNI: -	LOW PNI: 1.00	LOW PNI: -	LOW PNI: -
Subregion/Subbasin / *Species/Race*	Wind River, Columbia River Gorge / Spring Chinook				
Population Management Intent:	Conservation of steelhead; support	Conservation of natural populations	Conservation of steelhead; support	Minimize impacts to native steelhead	Minimize impacts to native steelhead
Harvest&Hatchery Strategy:	Segregated Hatchery; Terminal Harvest	None	Segregated Hatchery; Terminal Harvest	Segregated Hatchery; Terminal Harvest	Segregated Hatchery; Terminal Harvest
Population Recovery Designation	Not listed: excluded from ESU	Not listed: excluded from ESU	Not listed: excluded from ESU	Not listed: excluded from ESU	Not listed: excluded from ESU

Carson NFH			Historic		Current		No Hatchery		Alternatives 1 + 5		Long-Term Goal (15+ years)		Goal + 33%↑ term. Harvest	
Hab	Productivity (Adult)	Ad. Capacity			2.88	196	2.88	196	2.88	196	2.88	196	2.88	196
	Min NOR Escape	% Kelt			1		1		1		1		1	
	Smolt Productivity	Sm. Capacity			152.5	10,376	152.46	10,376	152.46	10,376	152.46	10,376	152.46	10,376
Hydro	Ocean Surv / Baseline SAR	Vary? (Y/N)		0.019	0.022 / 0.019	y	0.022 / 0.019	y	0.022 / 0.019	y	0.022 / 0.019	y	0.022 / 0.019	y
	Juv Passage Surv.	Adult Passage			0.90	0.97	0.90	0.97	0.90	0.97	0.90	0.97	0.90	0.97
	Adjusted Productivity	Adj. Capacity			2.88	196	2.88	196	2.88	196	2.88	196	2.88	196
Harv	*Active parameter documentation to see assumptions for selective and non-selective fisheries.*	Harv - Marine	NORs	HORs	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
		Harv - L. Mainstem	NORs	HORs	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075
		Harv - U. Mainstem	NORs	HORs	0.050	0.200	0.050	0.200	0.050	0.200	0.050	0.100	0.050	0.100
		Harv -Terminal	NORs	HORs	0.100	0.330	0.100	0.330	0.100	0.330	0.100	0.330		0.440
		Total Exploitation Rate	NORs	HORs	0.217	0.509	0.217	0.509	0.217	0.509	0.217	0.448	0.130	0.538
Hatch		Broodstock Composition	pNOB-Goal	pHOS-Goal	pNOB	pHOS	pNOB	pHOS	pNOB	pHOS	100	pHOS	pNOB	pHOS
			pNOB-Realized	pHOS-Realized		77%				73%		81%		77%
	Purpose	Type	Cons/Harv/Both	Int/Seg/Step/None	Harv	Seg	None	None	Harv	Seg	None	None	Harv	Seg
		Broodstock by Source	Local / Imported	Smolt Release	822	1,172,259		-	646	921,264	1000	1,426,106	1000	1,426,106
		Brood Exported (from HOR Surplus)	Export Goal/Realized	Strays	176 / 176				176 / 176					
		Destination for HOR Returns	% to Hatchery	% to Nat. Spawn.	90%	10%		100%	90%	10%	90%	10%	90%	10%
		Productivity of Hatchery Fish	Recruits/Spawner	Fitness? [Y / N]	9.0	y		y	9.0	y	9.0	y	9.0	y

Open AHA Dataset:

C:\Documents and Settings\dcampton\My Documents\ServerFiles\Workdir\FWS Hatchery Review Team\Regional-Hatchery Reviews\Columbia River Gorge\AHA datafiles\FWS Hatchery Review\Wind River\DC-WindSpringChinook 21Nov2007.aha

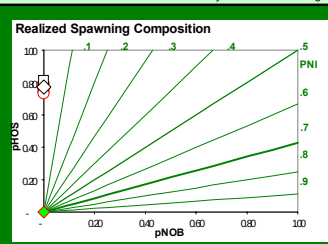
OPEN SAVE

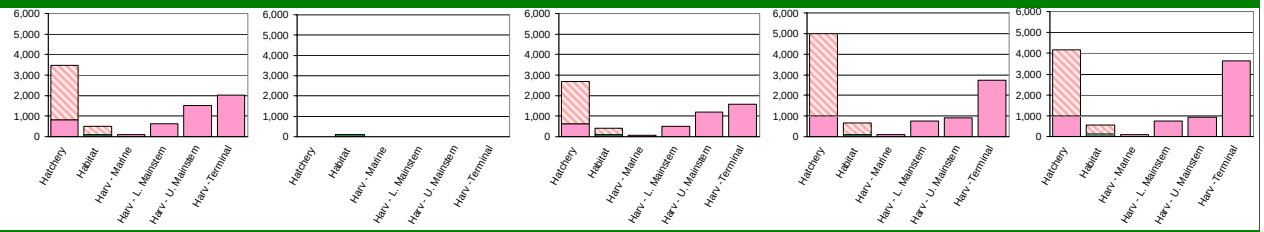
Parameter Documentation

Select alternatives (yes/no) for parameter documentation (current condition should always be documented)

	Yes	No
Current	☐	◉
Alt 2	☐	◉
Alt 3	☐	◉
Alt 4	☐	◉
Alt 5	☐	◉

Parameter Documentation Inactive for All Alternatives





Relative Hatchery Optimum ->	80	80	80	80	80
Weir Factor ->					
Relative Reproductive Success (HOS) ->	80%	80%	80%	80%	80%
Initial Fitness Factor (A)	0.81	0.81	0.81	0.81	0.81
Fitness Factor after 100 generations (B)	0.50	1.00	0.50	0.50	0.50
Average Fitness Factor (100 Generations)	0.50	0.99	0.50	0.50	0.50
Generations until average fitness is reached	13	30	13	13	13
Minimum Hatchery Program (as % of BS Goal):					
"Fitness Floor" -> 0.5					
Calculated Hatchery SAR ->	0.63%		0.63%	0.63%	0.63%
Calculated Natural SAR ->	1.9%	1.9%	1.9%	1.9%	1.9%

Table A2. AHA output for summer steelhead in Wind River, including an integrated hatchery program at Carson NFH. Two hatchery programs of different size (Alternative 2) are compared to the current "no program" scenario: (1) 100,000 smolt release that maintains pHOS ≤5%, and (2) the maximum-sized program (180,000) that maintains pHOS ≤ 10% and PNI > 0.67. The larger program reduces the number of natural-origin recruits.

All H Analyzer (AHA) — *Activate Scenario Documentation ---------->*

Version 7.2.4

July 31, 2007

					Biological Significance:	HIGH		HIGH	PNI: 1.00	HIGH	PNI: 0.87	HIGH	PNI: 0.77
					Population Management Intent:	Conservation: Natural Reproduciton Only		Conservation and Harvest		Conservation and Harvest		Conservation and Harvest	
					Harvest&Hatchery Strategy:	No hatchery program, improve habitat		Integrated: Terminal Selective Harvest		Integrated: Terminal Selective Harvest		Integrated: Terminal Selective Harvest	
					Population Recovery Designation	Primary		Primary		Primary		Primary	
Subregion/Subbasin: Wind River, Columbia River Gorge			Species/Race: Summer Steelhead										
Carson NFH					Historic			Current: No SH program		Alt. 2: Summer SH program		Alt. 2: Max. SR-SH program	
Hab	Productivity (Adult)	Ad. Capacity	17.73	3,814		4.37	1,230	4.37	1,230	4.37	1,230		
	Min NOR Escape	% Kelt	1	10%		1	10%	1	10%	1	10%		
	Smolt Productivity	Sm. Capacity		40,844		46.8	13,172	46.80	13,172	46.80	13,172		
Hydro	Ocean Surv (Baseline SAR)	Vary? (Y/N)	0.114 (0.093)	y		0.114 (0.093)	y	0.114 (0.093)	y	0.114 (0.093)	y		
	Juv Passage Surv.	Adult Passage	1.00	1.00		0.90	0.97	0.90	0.97	0.90	0.97		
	Adjusted Productivity	Adj. Capacity	21.72	4,673		4.67	1,316	4.69	1,321	4.69	1,321		
Harv	*Active parameter documentation to see assumptions for selective and non-selective fisheries.*	Harv - Marine	NORs	HORs		0.005		0.005	0.005	0.005	0.005		
		Harv - L. Mainstem	NORs	HORs		0.050		0.050	0.100	0.050	0.100		
		Harv - U. Mainstem	NORs	HORs		0.050		0.050	0.100	0.050	0.100		
		Harv -Terminal	NORs	HORs		0.060		0.060	0.500	0.100	0.500		
		Total Exploitation Rate	NORs	HORs		0.156		0.156	0.597	0.192	0.597		
Hatch						pNOB	pHOS	pNOB	pHOS	pNOB	pHOS		
	Broodstock Composition		pNOB-Goal	pHOS-Goal				33%	10%	33%	10%		
			pNOB-Realized	pHOS-Realized				33%	5%	33%	10%		
	Purpose	Type	Cons/Harv/Both	Int/Seg/Step/None		None	None	Both	Int	Both	Int		
	Broodstock by Source		Local	Imported	Smolt Release		-	74	101,149	134	183,229		
	Brood Exported (from HOR Surplus)		Export Goal/Realized		Strays								
	Destination for HOR Returns		% to Hatchery		% to Nat. Spawn.		100%	80%	20%	80%	20%		
	Productivity of Hatchery Fish		Recruits/Spawner		Fitness? [Y / N]		y	10.0	y	10.0	y		

Open AHA Dataset:

C:\Documents and Settings\dcampton\My Documents\ServerFiles\Workdir\FWS Hatchery Review Team\Regional-Hatchery Reviews\Columbia River Gorge\AHA datafiles\HSRG AHA Sept_28_2007\Wind\WindSummerSteelhead_E092707.aha

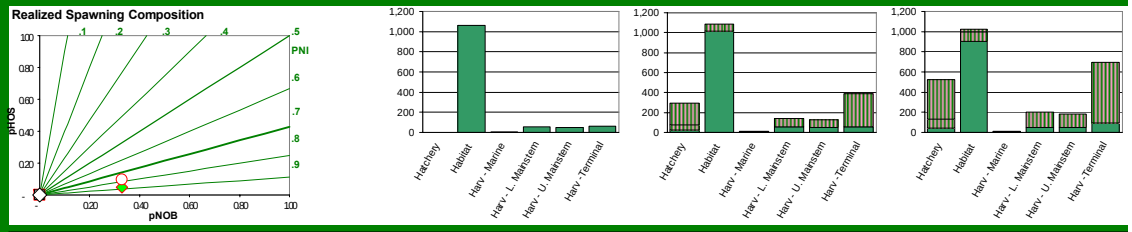
OPEN SAVE

Parameter Documentation

Select alternatives (yes/no) for parameter documentation (current condition should always be documented)

	Yes	No
Current	☐	◉
Alt 2	☐	◉
Alt 3	☐	◉
Alt 4	☐	◉
Alt 5	☐	◉

Parameter Documentation Inactive for All Alternatives



Relative Hatchery Optimum ->	80	80	80
Weir Factor ->			
Relative Reproductive Success (HOS) ->	80%	80%	80%
Initial Fitness Factor (A)	0.81	0.81	0.81
Fitness Factor after 100 generations (B)	1.00	0.97	0.92
Average Fitness Factor (100 Generations)	0.99	0.96	0.91
Generations until average fitness is reached	30	35	34
Minimum Hatchery Program (as % of BS Goal):			
"Fitness Floor" ->			
Calculated Hatchery SAR ->		0.73%	0.73%
Calculated Natural SAR ->	10.0%	10.0%	10.0%

Table A3. AHA output for fall Chinook in Wind River. The Review Team did not evaluate alternatives for the current management of fall Chinook in the Wind River.

All H Analyzer (AHA) — Version 7.2.4 — July 31, 2007

Activate Scenario Documentation -------> **Current**

Biological Significance: LOW MED PNI: 1.00

Subregion/Subbasin	*Species/Race*	*Population Management Intent:*	Conservation
Wind River, Columbia River Gorge	Fall Chinook	*Harvest&Hatchery Strategy:*	No direct hatchery releases; selective
		Population Recovery Designation	Stabilizing

Wind River Fall Chinook (Tule)				Historic		Current	
Hab	Productivity (Adult)		Ad. Capacity	7.67	1,549	4.54	692
	Min NOR Escape		% Kelt	1		1	
	Smolt Productivity		Sm. Capacity		416,384	1,221.4	185,917
Hydro	Ocean Surv	Baseline SAR	Vary? (Y/N)	0.004 0.004	y	0.004 0.004	y
	Juv Passage Surv.		Adult Passage	1.00	1.00	0.85	0.98
	Adjusted Productivity		Adj. Capacity	9.20	1,859	4.54	692
Harv	*Active parameter documentation to see assumptions for selective and non-selective fisheries.*		Harv - Marine	NORs	HORs	0.310	
			Harv - L. Mainstem	NORs	HORs	0.050	
			Harv - U. Mainstem	NORs	HORs	0.215	
			Harv -Terminal	NORs	HORs	0.050	
			Total Exploitation Rate	NORs	HORs	0.511	
Hatch						pNOB	pHOS
			Broodstock Composition	pNOB-Goal	pHOS-Goal		
				pNOB-Realized	pHOS-Realized		
	Purpose		Type	Cons/Harv/Both	Int/Seg/Step/None	None	None
			Broodstock by Source	Local / Imported	Smolt Release		-
			Brood Exported (from HOR Surplus)	Export Goal/Realized	Strays		
			Destination for HOR Returns	% to Hatchery	% to Nat. Spawn.		100%
			Productivity of Hatchery Fish	Recruits/Spawner	Fitness? [Y / N]	6.0	y

Open AHA Dataset:

C:\Documents and Settings\dcampton\My Documents\ServerFiles\Workdir\FWS Hatchery Review Team\Regional-Hatchery Reviews\Columbia River Gorge\AHA datafiles\HSR

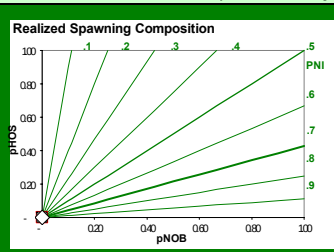
OPEN SAVE

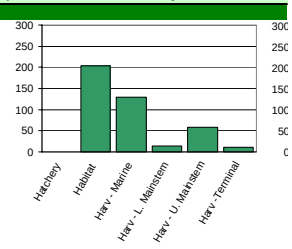
Parameter Documentation

Select alternatives (yes/no) for parameter documentation (current condition should always be documented)

	Yes	No
Current	☐	◉
Alt 2	☐	◉
Alt 3	☐	◉
Alt 4	☐	◉
Alt 5	☐	◉

Parameter Documentation Inactive for All Alternatives





Relative Hatchery Optimum ->	80
Weir Factor ->	
Relative Reproductive Success (HOS) ->	80%
Initial Fitness Factor (A)	0.81
Fitness Factor after 100 generations (B)	1.00
Average Fitness Factor (100 Generations)	0.99
Generations until average fitness is reached	30
Minimum Hatchery Program (as % of BS Goal):	
"Fitness Floor" ->	0.5
Calculated Hatchery SAR ->	0.40%
Calculated Natural SAR ->	0.4%

Table A4. AHA output for tule fall Chinook at Spring Creek NFH and the Big White Salmon River. See report for descriptions of alternatives.

All H Analyzer (AHA) — *Activate Scenario Documentation ------->*

Version 7.2.4

July 31, 2007

	Current	Alternate 4: No Hatchery	Alternate 1: 10.5 M release	Alt. 3: 10.5M + Condit removal	Current + Condit Dam removal
Biological Significance:	MED	MED PNI: -	MED PNI: 1.00	MED PNI: -	MED PNI: -	MED PNI: -
Subregion/Subbasin	White Salmon R., Columbia Gorge					
Species/Race	Tule Fall Chinook					
Population Management Intent:	Conservation and Harvest of tule fall	Conservation and Harvest of tule fall	Conservation and Harvest of tule fall	Conservation and Harvest of tule fall	Conservation and Harvest of tule fall
Harvest&Hatchery Strategy:	Segregated Harvest	Segregated + Selective Harvest	Segregated + Selective Harvest	Segregated + Selective Harvest	Segregated + Selective Harvest
Population Recovery Designation	Contributing	Contributing	Contributing	Contributing	Contributing
Spring Creek NFH + Big White Salmon R.	**Historic**	**Current**	**Alternate 4: No Hatchery**	**Alternate 1: 10.5 M release**	**Alt. 3: 10.5M + Condit removal**	**Current + Condit Dam removal**
Hab — Productivity (Adult) / Ad. Capacity	7.10 / 868	6.08 / 1,172	6.08 / 1,172	6.08 / 1,172	5.60 / 1,210	5.60 / 1,210
Hab — Min NOR Escape / % Kelt	1	1	1	1	1	1
Hab — Smolt Productivity / Sm. Capacity	87,730	614.5 / 118,456	614.51 / 118,456	614.51 / 118,456	566.00 / 122,296	566.00 / 122,296
Hydro — Ocean Surv / Baseline SAR / Vary? (Y/N)	0.128 / 0.010 / y	0.012 / 0.010 / Y	0.012 / 0.010 / Y	0.012 / 0.010 / Y	0.012 / 0.010 / Y	0.012 / 0.010 / Y
Hydro — Juv Passage Surv. / Adult Passage	1.00 / 1.00	0.85 / 0.97	0.85 / 0.97	0.85 / 0.97	0.85 / 0.97	0.85 / 0.97
Hydro — Adjusted Productivity / Adj. Capacity	91.85 / 11,229	6.08 / 1,172	6.08 / 1,172	6.08 / 1,172	5.60 / 1,210	5.60 / 1,210
Harv — *Active parameter documentation to see assumptions for selective and non-selective fisheries.* — Harv - Marine	NORs / HORs	0.310 / 0.310	0.310	0.310 / 0.310	0.310 / 0.310	0.310 / 0.310
Harv - L. Mainstem	NORs / HORs	0.050 / 0.100	0.050	0.050 / 0.100	0.050 / 0.100	0.050 / 0.100
Harv - U. Mainstem	NORs / HORs	0.215 / 0.430	0.050	0.215 / 0.430	0.215 / 0.430	0.215 / 0.430
Harv -Terminal	NORs / HORs					
Total Exploitation Rate	NORs / HORs	0.485 / 0.646	0.377	0.485 / 0.646	0.485 / 0.646	0.485 / 0.646
Hatch — Broodstock Composition	pNOB-Goal / pHOS-Goal	pNOB / pHOS	pNOB / pHOS	pNOB / pHOS	100 / pHOS	pNOB / pHOS
	pNOB-Realized / pHOS-Realized	100%		100%	5%	5%
		85%		80%	80%	85%
Purpose / Type	Cons/Harv/Both / Int/Seg/Step/None	Harv / Seg	Harv / Seg	Harv / Seg	Harv / Seg	Harv / Seg
Broodstock by Source	Local / Imported / Smolt Release	9636 / 15,101,264	-	6700 / 10,500,048	6700 / 10,500,048	9636 / 15,101,264
Brood Exported (from HOR Surplus)	Export Goal/Realized / Strays					
Destination for HOR Returns	% to Hatchery / % to Nat. Spawn.	90% / 10%	100%	90% / 10%	90% / 10%	90% / 10%
Productivity of Hatchery Fish	Recruits/Spawner / Fitness? [Y / N]	8.0 / y	8.0 / y	8.0 / y	8.0 / y	8.0 / y

Open AHA Dataset:

C:\Documents and Settings\dcampton\My Documents\ServerFiles\Workdir\FWS Hatchery Review Team\Regional-Hatchery Reviews\Columbia River Gorge\AHA datafiles\HSRG AHA Sept_28_2007\Big White Salmon\SpringCreekFallChinook.AHA

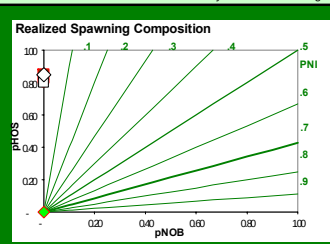
OPEN SAVE

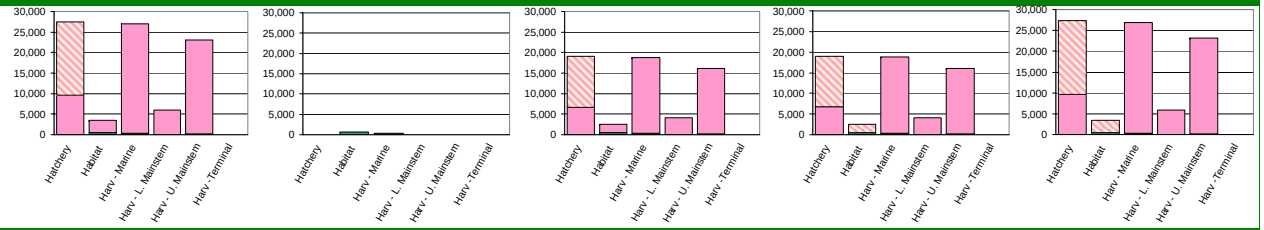
Parameter Documentation

Select alternatives (yes/no) for parameter documentation (current condition should always be documented)

	Yes	No
Current	☐	◉
Alt 2	☐	◉
Alt 3	☐	◉
Alt 4	☐	◉
Alt 5	☐	◉

Parameter Documentation Inactive for All Alternatives





Relative Hatchery Optimum ->	80	80	80	80	80
Weir Factor ->					
Relative Reproductive Success (HOS) ->	80%	80%	80%	80%	80%
Initial Fitness Factor (A)	0.81	0.81	0.81	0.81	0.81
Fitness Factor after 100 generations (B)	0.50	1.00	0.50	0.50	0.50
Average Fitness Factor (100 Generations)	0.50	0.99	0.50	0.50	0.50
Generations until average fitness is reached	13	30	13	13	13
Minimum Hatchery Program (as % of BS Goal):					
"Fitness Floor" -> 0.5					
Calculated Hatchery SAR ->	0.51%	0.51%	0.51%	0.51%	0.51%
Calculated Natural SAR ->	1.0%	1.0%	1.0%	1.0%	1.0%

Table A5. AHA output for spring Chinook at Little White Salmon NFH. The current hatchery program transfers 250,000 yearlings to Walla Walla River, but these transfers are to be assumed by Carson NFH in 2008. Under Alternative 2, the current Carson-strain broodstock is replaced by the Klickitat River stock via a "stepping stone" program where approximately 20% of the broodstock is derived from the integrated Klickitat River stock each generation.

All H Analyzer (AHA) — *Activate Scenario Documentation ---------->*

Version 7.2.4

July 31, 2007

			Current (w/ Walla Walla)	Current (no Walla Walla)	Alt. 2: Integ. Stepping Stone
Biological Significance:			LOW PNI: -	LOW PNI: -	LOW PNI: -
Subregion/Subbasin	Species/Race	*Population Management Intent:*	Support terminal fisheries	Support terminal fisheries	Transition to Klickitat River stock
Little White Salmon River	Spring Chinook	*Harvest&Hatchery Strategy:*	Segregated + selective harvest	Segregated + selective harvest	Segregated + selective harvest
		Population Recovery Designation	Not listed: excluded from ESU	Not listed: excluded from ESU	Not listed: excluded from ESU

Little White Salmon NFH Spring Chinook			Historic		Current (w/ Walla Walla)		Current (no Walla Walla)		Alt. 2: Integ. Stepping Stone	
Hab	Productivity (Adult)	Ad. Capacity	0.00	0	0.00	0	0.00	0	0.00	0
	Min NOR Escape	% Kelt	1		1		1		1	
	Smolt Productivity	Sm. Capacity		0	0.1	0	0.10	0	0.10	0
Hydro	Ocean Surv (Baseline SAR 0.020 0.010)	Vary? (Y/N)	0.020 0.010	y	0.020 0.010	y	0.020 0.010	y	0.020 0.010	y
	Juv Passage Surv.	Adult Passage	1.00	1.00	0.90	0.97	0.90	0.97	0.90	0.97
	Adjusted Productivity	Adj. Capacity	0.00	0	0.00	0	0.00	0	0.00	0
Harv	*Active parameter documentation to see assumptions for selective and non-selective fisheries.*	Harv - Marine	NORs	HORs	0.010	0.010	0.010	0.010	0.010	0.010
		Harv - L. Mainstem	NORs	HORs	0.075	0.075	0.075	0.075	0.075	0.075
		Harv - U. Mainstem	NORs	HORs	0.100	0.100	0.100	0.100	0.100	0.100
		Harv -Terminal	NORs	HORs		0.330		0.330		0.330
		Total Exploitation Rate	NORs	HORs	0.176	0.448	0.176	0.448	0.176	0.448
Hatch					pNOB	pHOS	pNOB	pHOS	pNOB	pHOS
	Broodstock Composition		pNOB-Goal	pHOS-Goal						
			pNOB-Realized	pHOS-Realized		100%		100%		100%
	Purpose	Type	Cons/Harv/Both	Int/Seg/Step/None	Harv	Seg	None	None	Harv	Seg
	Broodstock by Source		Local / Imported	Smolt Release	555	1,005,194	555	1,005,194	444 / 111	1,005,194
	Brood Exported (from HOR Surplus)		Export Goal/Realized	Strays	176 / 176					
	Destination for HOR Returns		% to Hatchery	% to Nat. Spawn.	90%	10%	90%	10%	90%	10%
	Productivity of Hatchery Fish		Recruits/Spawner	Fitness? [Y / N]	6.0	y	6.0	y	6.0	y

Open AHA Dataset:

C:\Documents and Settings\dcampton\My Documents\ServerFiles\Workdir\FWS Hatchery Review Team\Regional-Hatchery Reviews\Columbia River Gorge\AHA datafiles\HSRG AHA Sept_28_2007\Little White Salmon\LWS NFH spring Chinook.aha

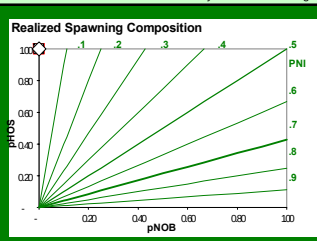
OPEN SAVE

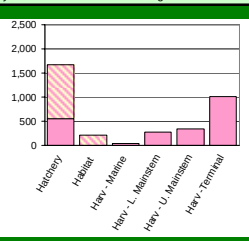
Parameter Documentation

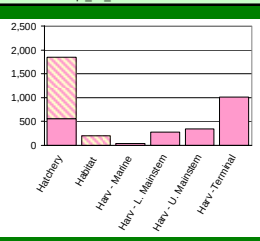
Select alternatives (yes/no) for parameter documentation (current condition should always be documented)

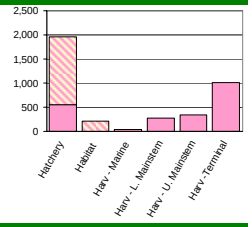
	Yes	No
Current	☐	◉
Alt 2	☐	◉
Alt 3	☐	◉
Alt 4	☐	◉
Alt 5	☐	◉

Parameter Documentation Inactive for All Alternatives









	Current (w/ Walla Walla)	Current (no Walla Walla)	Alt. 2: Integ. Stepping Stone
Relative Hatchery Optimum ->	80	80	80
Weir Factor ->			
Relative Reproductive Success (HOS) ->	80%	80%	80%
Initial Fitness Factor (A)	0.81	0.81	0.81
Fitness Factor after 100 generations (B)	0.50	0.50	0.50
Average Fitness Factor (100 Generations)	0.50	0.50	0.50
Generations until average fitness is reached	12	12	12
Minimum Hatchery Program (as % of BS Goal):			
"Fitness Floor" -> 0.5			
Calculated Hatchery SAR ->	0.33%	0.33%	0.33%
Calculated Natural SAR ->	1.7%	1.7%	1.7%

Table A6. AHA output for spring Chinook in the Big White Salmon River. The second and third scenarios after Condit Dam removal show habitat productivities and capacities before and after restoration of "properly functioning conditions" (PFC) . The fourth scenario models supplementation outplanting of the Klickitat River stock, while the last (fifth) scenario models strays (1% stray rate assumption) from Little White Salmon NFH.

All H Analyzer (AHA) — *Activate Scenario Documentation ---------->*

Version 7.2.4

July 31, 2007 — **Biological Significance:** HIGH

	Current: No Hatchery	Condit Dam Removal only	Condit Dam Removal + PFC	Condit Removal + supplement.	Condit Removal + LWS Strays
Biological Significance:	LOW PNI: 1.00	MED PNI: 1.00	MED PNI: 1.00	MED PNI: -	MED PNI: -
Subregion/Subbasin: Big White Salmon River					
Species/Race: Spring Chinook					
Population Management Intent:	None	Natural Recolonization	Natural Recolonization	Reintroduction and Conservation	Restoration and Conservation
Harvest&Hatchery Strategy:	No hatchery program	No hatchery program	No hatchery program	Import and release Klickitat Spring	1% stray rate from LWS NFH
Population Recovery Designation	N/A	Sustaining	Sustaining	Sustaining	Sustaining
Big White Salmon Spring Chinook	**Current: No Hatchery**	**Condit Dam Removal only**	**Condit Dam Removal + PFC**	**Condit Removal + supplement.**	**Condit Removal + LWS Strays**
Hab — Productivity (Adult) / Ad. Capacity	7.20 / 1,012	0.00 / 0	3.10 / 835	5.10 / 1,013	5.10 / 1,013	5.10 / 1,013
Hab — Min NOR Escape / % Kelt	1	1	1	1	1	1
Hab — Smolt Productivity / Sm. Capacity	516,327	0.5 / 1	1581.63 / 426,020	2602.04 / 516,837	2602.04 / 516,837	2602.04 / 516,837
Hydro — Ocean Surv / Baseline SAR	0.002 / 0.002	0.002 / 0.002	0.002 / 0.002	0.002 / 0.002	0.002 / 0.002	0.002 / 0.002
Hydro — Vary? (Y/N)	y	y	y	y	y	y
Hydro — Juv Passage Surv. / Adult Passage	1.00 / 1.00	0.95 / 0.98	0.95 / 0.98	0.95 / 0.98	0.95 / 0.98	0.95 / 0.98
Hydro — Adjusted Productivity / Adj. Capacity	7.35 / 1,033	0.00 / 0	3.46 / 933	5.70 / 1,132	5.70 / 1,132	5.70 / 1,132
Harv — *Active parameter documentation to see assumptions for selective and non-selective fisheries.*						
Harv - Marine	NORs / HORs	0.010	0.010	0.010	0.010	0.010
Harv - L. Mainstem	NORs / HORs	0.075	0.075	0.075	0.075	0.075
Harv - U. Mainstem	NORs / HORs	0.100	0.100	0.100	0.100	0.100
Harv -Terminal	NORs / HORs					
Total Exploitation Rate	NORs / HORs	0.176	0.176	0.176	0.176	0.176
Hatch —		pNOB / pHOS	pNOB / pHOS	pNOB / pHOS	100 / pHOS	pNOB / pHOS
Broodstock Composition	pNOB-Goal / pHOS-Goal				50%	5%
	pNOB-Realized / pHOS-Realized				45%	4%
Purpose / Type	Cons/Harv/Both / Int/Seg/Step/None	None / None	None / None	None / None	Cons / Seg	Cons / None
Broodstock by Source	Local / Imported / Smolt Release	-	-	-	106 / 191,983	-
Brood Exported (from HOR Surplus)	Export Goal/Realized / Strays					30
Destination for HOR Returns	% to Hatchery / % to Nat. Spawn.	100%	100%	100%	100%	100%
Productivity of Hatchery Fish	Recruits/Spawner / Fitness? [Y / N]	6.0 / y	6.0 / y	6.0 / y	6.0 / y	6.0 / y

Open AHA Dataset:

C:\Documents and Settings\dcampton\My Documents\ServerFiles\Workdir\FWS Hatchery Review Team\Regional-Hatchery Reviews\Columbia River Gorge\AHA datafiles\HSRG AHA Sept_20_2007\Chinook\HSRG-WhiteSalmonSpringChinook.aha

OPEN SAVE

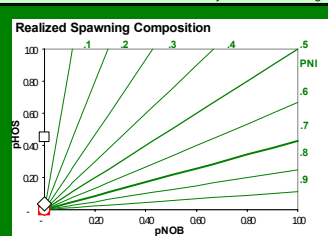
Parameter Documentation

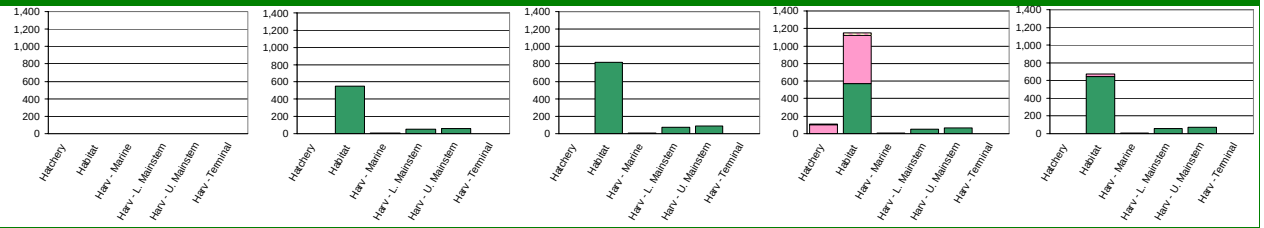
Select alternatives (yes/no) for parameter documentation (current condition should always be documented)

	Yes	No
Current	☐	◉
Alt 2	☐	◉
Alt 3	☐	◉
Alt 4	☐	◉
Alt 5	☐	◉

Parameter Documentation Inactive for All Alternatives

Realized Spawning Composition





	Current: No Hatchery	Condit Dam Removal only	Condit Dam Removal + PFC	Condit Removal + supplement.	Condit Removal + LWS Strays
Relative Hatchery Optimum ->	80	80	80	80	80
Weir Factor ->					
Relative Reproductive Success (HOS) ->	80%	80%	80%	80%	80%
Initial Fitness Factor (A)	0.81	0.81	0.81	0.81	0.81
Fitness Factor after 100 generations (B)	1.00	1.00	1.00	0.50	0.64
Average Fitness Factor (100 Generations)	0.99	0.99	0.99	0.50	0.74
Generations until average fitness is reached	30	30	30	16	42
Minimum Hatchery Program (as % of BS Goal):					
"Fitness Floor" -> 0.5					
Calculated Hatchery SAR ->	0.33%	0.33%	0.33%	0.33%	0.33%
Calculated Natural SAR ->	0.2%	0.2%	0.2%	0.2%	0.2%

Table A7. AHA output for upriver bright (URB) fall Chinook at Little White Salmon NFH and Little White Salmon River.

All H Analyzer (AHA) — *Activate Scenario Documentation ------->*

Version 7.2.4

July 31, 2007 — **Biological Significance:** LOW

	Current	75% program reduction
	LOW PNI: -	LOW PNI: -
Population Management Intent:	Seg	Seg
Harvest&Hatchery Strategy:	Seg	Seg
Population Recovery Designation		

Subregion/Subbasin: Little White Salmon River — *Species/Race*: URB Fall Chinook

Little White Salmon NFH URB Fall Chinook			Historic		Current		75% program reduction	
Hab	Productivity (Adult)	Ad. Capacity	0.00	0	0.00	0	0.00	0
	Min NOR Escape	% Kelt	1		1		1	
	Smolt Productivity	Sm. Capacity		0	0.1	0	0.10	0
Hydro	Ocean Surv / Baseline SAR	Vary? (Y/N)	0.000 / 0.010	y	0.010 / 0.010	y	0.010 / 0.010	y
	Juv Passage Surv.	Adult Passage	1.00	1.00	0.85	0.98	0.85	0.98
	Adjusted Productivity	Adj. Capacity	0.00	0	0.00	0	0.00	0
Harv	*Active parameter documentation to see assumptions for selective and non-selective fisheries.*	Harv - Marine	NORs	HORs		0.250		0.250
		Harv - L. Mainstem	NORs	HORs		0.082		0.082
		Harv - U. Mainstem	NORs	HORs		0.100		0.100
		Harv -Terminal	NORs	HORs		0.250		0.250
		Total Exploitation Rate	NORs	HORs		0.535		0.535
Hatch					pNOB	pHOS	pNOB	pHOS
	Broodstock Composition		pNOB-Goal	pHOS-Goal				
			pNOB-Realized	pHOS-Realized		100%		100%
	Purpose	Type	Cons/Harv/Both	Int/Seg/Step/None	Harv	Seg	Harv	Seg
	Broodstock by Source		Local / Imported	Smolt Release	1208	2,003,927	302	500,982
	Brood Exported (from HOR Surplus)		Export Goal/Realized	Strays	1070 / 1058			
	Destination for HOR Returns		% to Hatchery	% to Nat. Spawn.	75%	25%	75%	25%
	Productivity of Hatchery Fish		Recruits/Spawner	Fitness? [Y / N]	8.0	y	8.0	y

Open AHA Dataset:

C:\Documents and Settings\dcampton\My Documents\ServerFiles\Workdir\FWS Hatchery Review Team\Regional-Hatchery Reviews\Columbia River Gorge\AHA datafiles\HSRG AHA Sept_28_2007\Little White Salmon\LWS

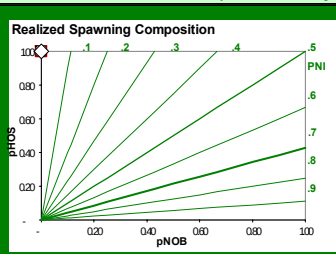
OPEN SAVE

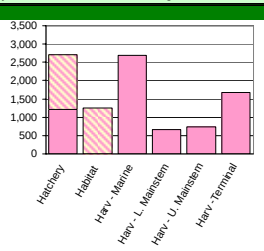
Parameter Documentation

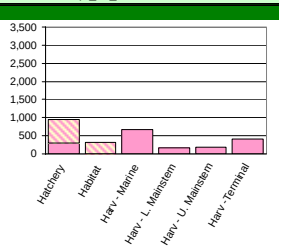
Select alternatives (yes/no) for parameter documentation (current condition should always be documented)

	Yes	No
Current	☐	◉
Alt 2	☐	◉
Alt 3	☐	◉
Alt 4	☐	◉
Alt 5	☐	◉

Parameter Documentation Inactive for All Alternatives







Relative Hatchery Optimum ->	80	80
Weir Factor ->		
Relative Reproductive Success (HOS) ->	80%	80%
Initial Fitness Factor (A)	0.81	0.81
Fitness Factor after 100 generations (B)	0.50	0.50
Average Fitness Factor (100 Generations)	0.50	0.50
Generations until average fitness is reached	12	12
Minimum Hatchery Program (as % of BS Goal):		
"Fitness Floor" -> 0.5		
Calculated Hatchery SAR ->	0.48%	0.48%
Calculated Natural SAR ->	0.8%	0.8%

Pacific Region Fishery Resources
911 NE 11th Avenue
Portland, OR 97232
503/872.2763
E-Mail: Douglas_dehart@fws.gov

U.S. Fish and Wildlife Service
www.fws.gov

For Columbia River Basin Hatchery Review Information
www.fws.gov/pacific/Fisheries/Hatcheryreview/

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people.

December 2007