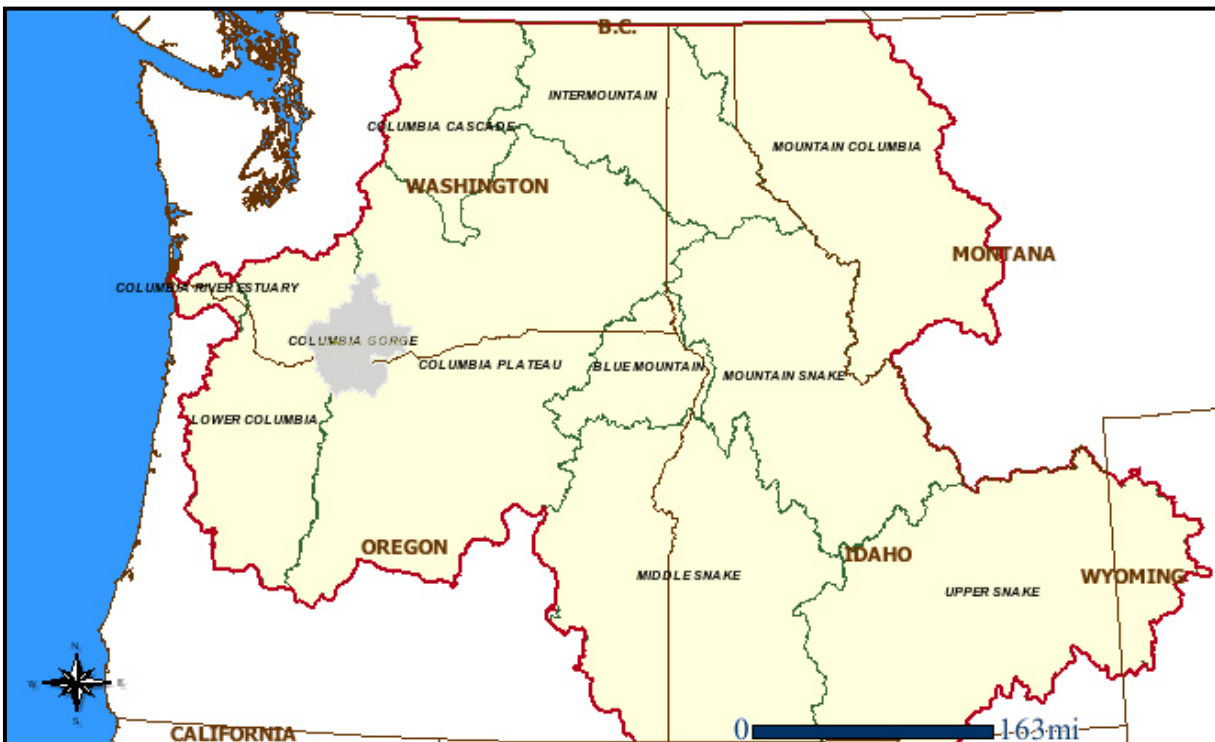




**U.S. Fish and Wildlife Service - Pacific Region  
Columbia River Basin Hatchery Review Team**

**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<sup>1</sup> 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)<sup>2</sup> 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

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<sup>1</sup> [www.hatcheryreform.org](http://www.hatcheryreform.org)

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

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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<sup>3</sup> can contribute to stock extirpation.

*For more detail on AHA, see AHA Technical Discussion Paper on the Publications page of [www.hatcheryreform.org](http://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](http://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/](http://www.fws.gov/pacific/fisheries/hatcheryreview/reports.html/).*

### ***Explanation of Tables A1-A7<sup>4</sup>***

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

---

<sup>3</sup> *Habitat, Harvest, Hydropower effects, Hatchery program effects.*

<sup>4</sup> *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.*

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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 from the Chair of the Hatchery Review Team. Some familiarity with AHA is required, and expected, before implementing the software.

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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											
Biological Significance: LOW											
Population Management Intent: Conservation of steelhead; support Segregated Hatchery; Terminal Harvest											
Harvest & Hatchery Strategy: Not listed: excluded from ESU											
Population Recovery Designation: Not listed: excluded from ESU											
Subregion/Subbasin: Wind River, Columbia River Gorge											
Species/Race: Spring Chinook											
Carson NFH											
Historic											
Current											
No Hatchery											
Alternatives 1 + 5											
Long-Term Goal (15+ years)											
Goal + 33% term. Harvest											
Hab											
Productivity (Adult)											
Ad. Capacity											
Min NOR Escape											
Sm. Capacity											
Hydro											
Ocean Surv. Baseline SAR											
Vary? (Y/N)											
Juv Passage Surv.											
Adult Passage											
Adjusted Productivity											
Harv											
Harv - Marine											
NORs											
HORs											
Harv - L. Mainstem											
NORs											
HORs											
Harv - U. Mainstem											
NORs											
HORs											
Harv - Terminal											
NORs											
HORs											
Total Exploitation Rate											
Hatch											
Broodstock Composition											
pNOB-Goal											
pHOS-Goal											
pNOB-Realized											
pHOS-Realized											
Cons/Harv/Both											
Int/Seg/Step/None											
Harv											
Seg											
Broodstock by Source											
Local											
Imported											
Smolt Release											
Export Goal/Realized											
Strays											
Destination for HOR Returns											
% to Hatchery											
% to Nat. Spawn.											
Recruits/Spawner											
Fitness? (Y / N)											
Open AHA Dataset:											
C:\Documents and Settings\scampton\My Documents\ServerFiles\World\HFW\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											
Realized Spawning Composition											
Relative Hatchery Optimum >											
Weir Factor >											
Relative Reproductive Success (HOS) >											
Initial Fitness Factor (A)											
Fitness Factor after 100 generations (B)											
Average Fitness Factor (100 Generations)											
Generations until average fitness is reached											
Minimum Hatchery Program (as % of BS Goal):											
Fitness Floor > 0.5											
Calculated Hatchery SAR >											
Calculated Natural SAR >											

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**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)

Version 7.2.4

July 31, 2007

Activate Scenario Documentation

Current: No SH program

Alt. 2: Summer SH program

Alt. 2: Max. SR-SH program

Biological Significance: HIGH

HIGH

PNI: 1.00

HIGH

PNI: 0.87

HIGH

PNI: 0.77

Subregion/Subbasin

Species/Race

Population Management Intent:

Conservation: Natural Reproduction Only

Conservation and Harvest

Conservation and Harvest

Wind River, Columbia River Gorge

Summer Steelhead

Harvest&Hatchery Strategy:

No hatchery program, improve habitat

Integrated: Terminal Selective Harvest

Integrated: Terminal Selective Harvest

Primary

Primary

Primary

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

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

Harv - L. Mainstem

NORs

HORs

0.050

0.100

0.050

0.100

Harv - U. Mainstem

NORs

HORs

0.050

0.100

0.050

0.100

Harv - Terminal

NORs

HORs

0.060

0.500

0.100

0.500

Total Exploitation Rate

NORs

HORs

0.156

0.597

0.192

0.597

Hatch

Broodstock Composition

pNOB-Goal

pHOS-Goal

pNOB

pHOS

pNOB

pHOS

pNOB

pHOS

Purpose

Type

pNOB-Realized

pHOS-Realized

Cons/Harv/Both

Int/Seg/Step/None

None

None

33%

10%

33%

10%

Broodstock by Source

Local

Imported

Both

Int

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%

Productivity of Hatchery Fish

Recruits/Spawner

Fitness? [Y / N]

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

Realized Spawning Composition

Hatchery

Habitat

Harv - Marine

Harv - L. Mainstem

Harv - U. Mainstem

Harv - Terminal

Hatchery

Habitat

Harv - Marine

Harv - L. Mainstem

Harv - U. Mainstem

Harv - Terminal

Hatchery

Habitat

Harv - Marine

Harv - L. Mainstem

Harv - U. Mainstem

Harv - Terminal

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 ES Goal):

"Fitness Floor" ->

Calculated Hatchery SAR ->

0.73%

0.73%

Calculated Natural SAR ->

10.0%

10.0%

10.0%

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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: Wind River, Columbia River Gorge Species/Race: Fall Chinook

Population Management Intent: Conservation  
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	
	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	Broodstock Composition		pNOB-Goal	pHOS-Goal	pNOB	pHOS	
	Purpose	Type	pNOB-Realized	pHOS-Realized			
	Broodstock by Source		Cons/Harv/Both	Int/Seg/Step/None	None	None	
	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	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Alt 2	<input type="checkbox"/>	<input type="checkbox"/>
Alt 3	<input type="checkbox"/>	<input type="checkbox"/>
Alt 4	<input type="checkbox"/>	<input type="checkbox"/>
Alt 5	<input type="checkbox"/>	<input type="checkbox"/>

Parameter Documentation Inactive for All Alternatives

Realized Spawning Composition

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%



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**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 →		Current	Alternate 4: No Hatchery	Alternate 1: 10.5 M release	Alt. 3: 10.5M + Condit removal	Current + Condit Dam removal			
Version 7.2.4													
July 31, 2007													
Subregion/Subbasin		Species/Race		Population Management Intent:		MED		MED		MED			
White Salmon R., Columbia Gorge		Tule Fall Chinook		Harvest&Hatchery Strategy:		PNI: 1.00		PNI: 1.00		PNI: 1.00			
Population Recovery Designation				Conservation and Harvest of tule fall Segregated Harvest		Conservation and Harvest of tule fall Segregated + Selective Harvest		Conservation and Harvest of tule fall Segregated + Selective Harvest		Conservation and Harvest of tule fall Segregated + Selective Harvest			
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	
	Min NOR Escape	% Kelt	1		1		1		1		1		
	Smolt Productivity	Sm. Capacity		87,730	614.5	118,456	614.51	118,456	614.51	118,456	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	
	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
	Adjusted Productivity	Adj. Capacity		91.85	11,229	6.08	1,172	6.08	1,172	6.08	1,172	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	
		Harv - L. Mainstem	NORs	HORs	0.050	0.100	0.050		0.050	0.100	0.050	0.100	
		Harv - U. Mainstem	NORs	HORs	0.215	0.430	0.050		0.215	0.430	0.050	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	
Hatch	Broodstock Composition		pNOB-Goal	pHOS-Goal	pNOB	pHOS	pNOB	pHOS	pNOB	pHOS	pNOB	pHOS	
	Purpose		pNOB-Realized	pHOS-Realized									
	Type		Cons/Harv/Both	Int/Seg/Step/None	Harv	Seg	Harv	Seg	Harv	Seg	Harv	Seg	
	Broodstock by Source		Local	Imported	Smolt Release								
	Brood Exported (from HOR Surplus)		Export Goal/Realized	Strays	9636	15,101,264			6700	10,500,048	6700	10,500,048	
	Destination for HOR Returns		% to Hatchery	% to Nat. Spawn.	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	
	Recruits/Spawner												
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													
Realized Spawning Composition													
Relative Hatchery Optimum >		80											
Weir Factor >													
Relative Reproductive Success (HOS) >		80%											
Initial Fitness Factor (A)		0.81											
Fitness Factor after 100 generations (B)		0.50											
Average Fitness Factor (100 Generations)		0.50											
Generations until average fitness is reached		13											
Minimum Hatchery Program (as % of BS Goal):													
Fitness Floor >		0.5											
Calculated Hatchery SAR >		0.51%											
Calculated Natural SAR >		1.0%											

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**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)**  
Version 7.2.4  
July 31, 2007

Activate Scenario Documentation →

Current (w/ Walla Walla)    Current (no Walla Walla)    Alt. 2: Integ. Stepping Stone

Biological Significance: LOW    PN: LOW    PN: LOW    PN: LOW

Subregion/Subbasin: Little White Salmon River    Species/Race: Spring Chinook    Population Management Intent: Harvest & Hatchery Strategy: Support terminal fisheries Segregated + selective harvest    Support terminal fisheries Segregated + selective harvest    Transition to Klickitat River stock 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
	Min NOR Escape	% Kelt	1	1	1	1
	Smolt Productivity	Sm. Capacity	0	0.1	0.10	0
Hydro	Ocean Surv.	Baseline SAR	0.020	0.010	0.020	0.010
	Juv Passage Surv.	Adult Passage	1.00	0.97	0.90	0.97
	Adjusted Productivity	Adj. Capacity	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
		Harv - L. Mainstem	NORs	HORs	0.075	0.075
		Harv - U. Mainstem	NORs	HORs	0.100	0.100
		Harv - Terminal	NORs	HORs	0.330	0.330
Total Exploitation Rate			0.176	0.448	0.176	0.448
Hatch	Broodstock Composition		pNOB-Goal	pHOS-Goal	pNOB	pHOS
	Purpose		pNOB-Realized	pHOS-Realized		
	Type		Cons/Harv/Both	Int/Seg/Step/None		
	Broodstock by Source		Local	Imported		
	Brood Exported (from HOR Surplus)		Smolt Release			
	Destination for HOR Returns		Export Goal/Realized			
	Productivity of Hatchery Fish		% to Hatchery	% to Nat. Spawn.		
			Recruits/Spawner	Fitness? [Y / N]		

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

**Realized Spawning Composition**

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%

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**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)

Version 7.2.4

July 31, 2007

Activate Scenario Documentation

Current: No Hatchery

Condit Dam Removal only

Condit Dam Removal + PFC

Condit Removal + supplement.

Condit Removal + LWS Strays

Biological Significance:

HIGH

LOW

PNI: 1.00

MED

PNI: 1.00

MED

PNI: 1.00

MED

PNI:

MED

PNI:

Subregion/Subbasin

Species/Race

Population Management Intent:

Harvest&Hatchery Strategy:

Population Recovery Designation

Big White Salmon River

Spring Chinook

None

Natural Recolonization

Natural Recolonization

Reintroduction and Conservation

Import and release Klickitat Spring

Restoration and Conservation

1% stray rate from LWS NFH

N/A

Sustaining

Sustaining

Sustaining

Sustaining

Big White Salmon Spring Chinook

Historic

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

Min NOR Escape

% Kelt

1

1

1

1

1

1

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

Vary? (Y/N)

0.002

0.002

y

0.002

0.002

y

0.002

0.002

y

0.002

0.002

y

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

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

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

0.176

0.176

0.176

0.176

0.176

0.176

Total Exploitation Rate

NORs

HORs

0.176

0.176

0.176

0.176

0.176

0.176

Hatch

Broodstock Composition

pNOB-Goal

pHOS-Goal

pNOB-Realized

pHOS-Realized

Cons/Harv/Both

Int/Seg/Step/None

None

None

None

None

None

None

Cons

Seg

Cons

None

Broodstock by Source

Local

Imported

Smolt Release

Strays

Brood Exported (from HOR Surplus)

Export Goal/Realized

% to Hatchery

% to Nat. Spawn.

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\ldcampton\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

Relative Hatchery Optimum ->

Weir Factor >

Relative Reproductive Success (HOS) >

Initial Fitness Factor (A)

Fitness Factor after 100 generations (B)

Average Fitness Factor (100 Generations)

Generations until average fitness is reached

Minimum Hatchery Program (as % of BS Goal):

Fitness Floor >

Calculated Hatchery SAR ->

Calculated Natural SAR ->

0.00

0.20

0.40

0.60

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# USFWS Columbia Basin Hatchery Review Team

## Columbia Gorge NFHs Assessments and Recommendations Report – December 2007

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

### All H Analyzer (AHA)

Version 7.2.4  
July 31, 2007

Activate Scenario Documentation →

Current 75% program reduction

Biological Significance: LOW

Population Management Intent: LOW PNI: LOW PNI:

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

Harvest&Hatchery Strategy: Population Recovery Designation

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
	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	Broodstock Composition		pNOB-Goal	pHOS-Goal		pNOB		pHOS	
	Purpose		pNOB-Realized	pHOS-Realized					
	Type		Cons/Harv/Both	Int/Seg/Step/None		Harv		Seg	
	Broodstock by Source		Local	Imported	Smolt Release				
	Brood Exported (from HOR Surplus)		Export Goal/Realized	Strays		1208		2,003,927	
	Destination for HOR Returns		% to Hatchery	% to Nat. Spawn.		1070		302	
	Productivity of Hatchery Fish		Recruits/Spawner	Fitness? [Y / N]		75%		25%	
						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\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

Realized Spawning Composition

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 11<sup>th</sup> Avenue**  
**Portland, OR 97232**  
**503/872.2763**  
**E-Mail: [Douglas\\_dehart@fws.gov](mailto:Douglas_dehart@fws.gov)**

**U.S. Fish and Wildlife Service**  
**[www.fws.gov](http://www.fws.gov)**

**For Columbia River Basin Hatchery Review Information**  
**[www.fws.gov/pacific/Fisheries/Hatcheryreview/](http://www.fws.gov/pacific/Fisheries/Hatcheryreview/)**

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**December 2007**

