



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

Columbia River Basin, Columbia Cascade Province
Wenatchee, Entiat and Methow River Watersheds



**Leavenworth, Entiat and Winthrop National Fish Hatcheries
Assessments and Recommendations**

**Final Report, Appendix A:
All-H Analyzer (AHA) Output for Salmon and Steelhead Stocks**

April 2007

Appendix A: All-H Analyzer (AHA) output for salmon and steelhead stocks in the mid-Columbia Region

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. The Columbia River version of AHA allocates returning adults to four physical geographic locations: (1) a hatchery, if one exists within the watershed under consideration; (2) the natural habitat within the watershed where adults spawn; (3) a mixed-stock harvest area representing marine areas, estuarine areas, and the mainstem Columbia River; and (4) 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 review¹ of salmon and steelhead hatcheries in the Puget Sound and coastal regions of 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 productivity represents the slope of the spawner-recruit curve at the origin (i.e., the number of adult recruits per adult spawner 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 pages (e.g. natural component page, hatchery component page, genetic fitness page, etc.) where 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 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 considered valid. For example, any scenario that results in extirpation of a stock is considered invalid, where any or all of the four H's³ 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/.

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.

³ Habitat, Harvest, Hydropower effects, Hatchery program effects

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Explanation of Tables A1-A9⁴

Information in the following tables (Tables A1-A9) is adapted from, and intended to provide, a “snapshot” of the results from co-manager workshops on these stocks conducted in the spring of 2006. Five “conditions” are simulated for each stock (spreadsheet). The *Historic* condition simulates the natural population dynamics of the stock before the advent of hydropower, harvest, hatcheries, and degraded habitat influences. The *Short-Term* and *Long Term* conditions simulate the 10-15 year goals and 50-75 year goals, respectively, of the *Watershed Planning Process* of the Northwest Power and Conservation Council and Comanagers. For the hatchery stocks propagated by the Service, the short-term and long-term scenarios are replaced with two of the alternatives proposed by the Review Team, including the recommended alternative. As a measure of comparison, the “no hatchery” option is also presented to show the predicted equilibrium abundance of the natural population of the same species within the watershed if the hatchery program was terminated.

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. Light-blue diagonal stripes represent hatchery-origin fish in excess of comanager goals, and gray vertical stripes 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 constitution 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 hatchery-origin fish will be determined primarily by the natural environment (Note: In practice, *pNOB* must be greater than 0.1 to overcome random genetic effects and single-generation selection effects of the hatchery). When *pHOS* = *pNOB*, then the hatchery and natural environments will have equal influence on the genetic constitutions of both hatchery and wild fish, and *PNI* = 0.5. For integrated hatchery populations and natural stocks, the goal is for *pNOB* to be as close to 1.0 as possible with *PNI* = 0.5 as the minimum acceptable value as a long-term goal. Symbols on the *PNI* graph correspond with each of the four scenarios shown to the right of the “historic” condition (see also the *Components of this Report* section for definitions of biological significance, population viability, habitat and harvest ratings).

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. In addition, tables for some stocks are still being developed and verified (e.g. Methow River summer Chinook).

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Table A1. Icicle Creek - Leavenworth NFH Spring Chinook (Segregated Hatchery)

Biological Significance:				LOW		LOW		LOW		HIGH	
Subbasin	Species	Administrator	Mgt Intent: Mgt Strategy:	Conservation - Recovery No Hatchery Program		Harvest Segregated Hatchery		Harvest Current w/reduced densities		Harvest Stepping Stone Native Brood	
Wenatchee	Spring Chinook	Casey Baldwin		No Hatchery Program		Current Hatchery Program		Alternative 1		Alternative 3	
Icicle Creek Spring Chinook (Leavenworth NFH)				Historic		No Hatchery Program		Current Hatchery Program		Alternative 1	
Hab	[EDT] Prod. Capacity			5.65	3,410	1.10	200	1.10	200	1.10	500
	Min NOR Escape %Kelt			1		1		1		1	
	Smolt Prod. Capacity			323	194,746	63	11,422	63	11,422	63	28,555
Hydro	Ocean Surv	Baseline S	Vary? (Y/N)	0.046	0.018	y		0.046	0.018	y	
	Passage Surv	Juvenile	Adult	1.00	1	0.45	0.85	0.45	0.85	0.45	0.85
	Adj. Prod. Adj. Capacity			14.74	8,898	1.10	200	1.10	200	1.09	497
Harv	Harv-Mixed Stock			NORs	HORs	0.110		0.110	0.160	0.110	0.160
	Harv-Terminal			NORs	HORs	0.010		0.010	0.420	0.010	0.420
	Total Exploitation Rate			NORs	HORs	0.168		0.17	0.57	0.16	0.57
Hatch	Broodstock Composition			pNOB-Goal	pHOS-Goal	pNOB		pHOS		pNOB	
				pNOB-Realized	pHOS-Realized						
	Hatchery Type ->			[Int /Seg /None]		Local		Import		Local	
	Broodstock Numbers by Source			Local	Imported	Smolt Release		Local		Import	
	Brood Exported (from HOR Surplus)			Exported Brood	Strays						
	Destination for HOR Returns			% to Hatchery	% to Nat. Spawn.						
	Productivity of Hatchery Fish			Recruits/Spwnr	Fitness? [Y / N]						
						100%		95%		95%	
						y		7.2		8.5	
						y		y		y	

OPEN

SAVE

Expl Rate

Harv. Rate

0.10	0.10
0.10	0.11
0.10	0.13
0.30	0.30

Realized Spawning Composition

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Table A2. Chiwawa River Spring Chinook (Natural + Integrated Hatchery)

Biological Significance:				HIGH		HIGH		HIGH		HIGH	
Subbasin	Species	Administrator	Mgt Intent:	Harvest and Conservation		Conservation-Recovery		Conservation-Harvest		Conservation-Harvest	
Wenatchee	Spring Chinook	Casey Baldwin	Mgt Strategy:	Habitat Protection		Hatchery Supplementation		Leavenworth NFH Alternate 3		Habitat-Hydro Improvements	
Chiwawa River Spring Chinook				Historic		Before Hatchery Program		Current Hatchery Program		Short-term: 10-15 years	
Hab	[EDT] Prod. Capacity	6.31	4,951	4.26	2,092	4.26	2,092	4.26	2,092	4.78	4,405
	Min NOR Escape %Kelt	1		1		1		1		1	
	Smolt Prod. Capacity	360	282,749	243	119,480	243	119,480	243	119,475	273	251,573
Hydro	Ocean Surv	Baseline S	Vary? (Y/N)	0.018	0.018	y	0.016	0.018	y	0.016	0.018
	Passage Surv	Juvenile	Adult	1.00	1	0.45	0.85	0.45	0.85	0.54	0.85
	Adj. Prod. Adj. Capacity	6.31	4,951	1.53	751	1.53	751	1.53	751	2.04	1,885
Harv	Harv-Mixed Stock	NORs	HORs	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110
	Harv-Terminal	NORs	HORs	0.010	0.010	0.010	0.010	0.010	0.010	0.050	0.010
	Total Exploitation Rate	NORs	HORs	0.119	0.12	0.12	0.12	0.12	0.12	0.15	0.12
Hatch	Broodstock Composition			pNOB		pHOS		pNOB		pHOS	
	pNOB-Goal			pHOS-Goal		33%		33%		50%	
	pNOB-Realized			pHOS-Realized		33%		33%		50%	
	Hatchery Type ->			[Int / Seg / None]		Local		Local		Local	
	Broodstock Numbers by Source			Smolt Release		378		250		250	
	Brood Exported (from HOR Surplus)			Strays		672,481		444,763		444,763	
	Destination for HOR Returns			100%		20%		50%		50%	
	Productivity of Hatchery Fish			Fitness? [Y / N]		5.8		5.8		5.8	

OPEN

SAVE

Expl Rate → Harv. Rate

0.10	0.10
0.10	0.11
0.10	0.13
0.30	0.30

Realized Spawning Composition

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Table A3. Wenatchee River Summer Chinook (Natural + Integrated Hatchery)

Biological Significance:				HIGH			HIGH			HIGH			HIGH															
Subbasin		Species		Administrator		Mgt Intent:		Harvest and Conservation			Harvest and Mitigation			Harvest and Mitigation			Harvest and Mitigation											
Wenatchee		Summer Chinook		Casey Baldwin		Mgt Strategy:		Habitat Protection			Hatchery Supplementation			Hatchery + Hydro survival			Hatchery + Hydro survival											
Wenatchee River Summer Chinook				Historic			Before Hatchery Program			Current Hatchery Program			Short-term: 10-15 years			Long-term: 50-75 years												
Hab	[EDT] Prod. Capacity			10.79		19,150		4.25		13,360		4.25		13,360		4.25		13,360		8.39		17,973						
	Min NOR Escape %Kelt			1				1				1				1				1								
	Smolt Prod. Capacity			1347		2,390,762		531		1,667,915		531		1,667,915		531		1,667,915		1048		2,243,820						
Hydro	Ocean Surv	Baseline S	Vary? (Y/N)	0.035	0.008	y		0.035	0.008	y		0.035	0.008	y		0.035	0.008	y		0.035	0.008	y						
	Passage Surv	Juvenile	Adult	1.00		1		0.27		0.85		0.27		0.85		0.30		0.85		0.33		0.85						
	Adj. Prod. Adj. Capacity			46.62		82,731		4.25		13,360		4.25		13,360		4.67		14,686		10.12		21,673						
Harv	Harv-Mixed Stock			NORs		HORs		0.110		0.110		0.110		0.110		0.110		0.110		0.110		0.110						
	Harv-Terminal			NORs		HORs																						
	Total Exploitation Rate			NORs		HORs		0.110		0.11		0.11		0.11		0.11		0.11		0.11		0.11						
Hatch	Broodstock Composition			pNOB-Goal		pHOS-Goal		pNOB			pHOS			pNOB			pHOS			pNOB			pHOS					
	Hatchery Type ->			pNOB-Realized		pHOS-Realized		90%			90%			90%			90%			90%			90%					
	Broodstock Numbers by Source			[Int /Seg /None]				90%			19%			17%			11%			11%			11%					
	Brood Exported (from HOR Surplus)			[Int /Seg /None]				90%			19%			17%			11%			11%			11%					
	Destination for HOR Returns			Local		Imported		Local			Import			Local			Import			Local			Import					
	Productivity of Hatchery Fish			Smolt Release				476			864,003			864,003			864,003			864,003			864,003					
				Exported Brood		Strays																						
				% to Hatchery		% to Nat. Spawn.		100%			10%			90%			10%			90%			5%			95%		
				Recruits/Spwnr		Fitness? [Y / N]		y			5.0			y			5.0			y			5.0			y		

OPEN

SAVE

Expl Rate

Harv. Rate

0.10	0.10
0.10	0.11
0.10	0.13
0.30	0.30

Realized Spawning Composition

25,000

20,000

15,000

10,000

5,000

0

Hatchery

Habitat

Harv-Mixed Stock

Harv-Terminal

25,000

20,000

15,000

10,000

5,000

0

Hatchery

Habitat

Harv-Mixed Stock

Harv-Terminal

25,000

20,000

15,000

10,000

5,000

0

Hatchery

Habitat

Harv-Mixed Stock

Harv-Terminal

25,000

20,000

15,000

10,000

5,000

0

Hatchery

Habitat

Harv-Mixed Stock

Harv-Terminal

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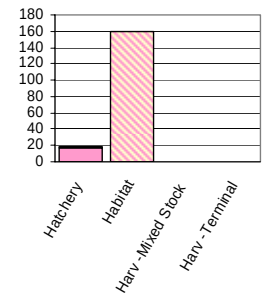
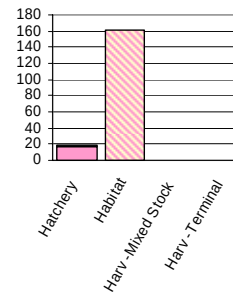
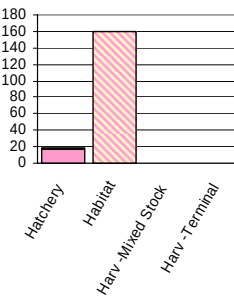
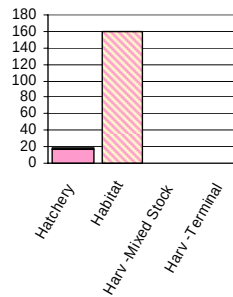
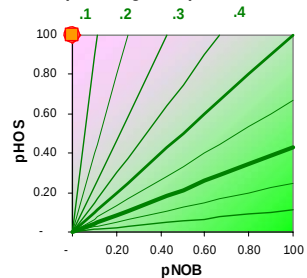
Table A4. Lake Wenatchee Sockeye Salmon (Natural + Integrated Hatchery)⁵

Biological Significance:				HIGH		HIGH		HIGH		HIGH	
Subbasin	Species	Administrator	Mgt Intent: Mgt Strategy:	Conservation and Harvest Hatchery Supplementation		Conservation and Harvest Hatchery Supplementation		Conservation and Harvest Hatchery Supplementation		Conservation and Harvest Hatchery Supplementation;	
Wenatchee	Sockeye	Casey Baldwin		Hatchery Supplementation		Hatchery Supplementation		Hatchery Supplementation		Hatchery Supplementation;	
Wenatchee Sockeye				Historic		Before ESA Listings		Current		Short-Term (10-15 years)	
Hab	[EDT] Prod. Capacity			0.00	0	0.00	0	0.00	0	0.00	0
	Min NOR Escape %Kelt			1		1		1		1	
	Smolt Prod. Capacity			0	0	0	0	0	0	0	0
Hydro	Ocean Surv	Baseline S.	Vary? (Y/N)	0.104	0.040	y		0.104	0.040	y	
	Passage Surv	Juvenile	Adult	1.00	1	0.45	0.85	0.45	0.85	0.45	0.85
	Adj. Prod. Adj. Capacity			0.00	0	0.00	0	0.00	0	0.00	0
Harv	Harv-Mixed Stock		NORs	HORs							
	Harv-Terminal		NORs	HORs							
	Total Exploitation Rate		NORs	HORs							
Hatch	Broodstock Composition			pNOB-Goal		pHOS-Goal		pNOB-Goal		pHOS-Goal	
				100%		100%		100%		100%	
	Hatchery Type ->			pNOB-Realized		pHOS-Realized		pNOB-Realized		pHOS-Realized	
				[Int /Seg /None]		[Int /Seg /None]		[Int /Seg /None]		[Int /Seg /None]	
	Broodstock Numbers by Source			Local	Imported	Local	Imported	Local	Imported	Local	Imported
	Brood Exported (from HOR Surplus)			213		213		213		213	
	Destination for HOR Returns			% to Hatchery		% to Nat. Spawn.		% to Hatchery		% to Nat. Spawn.	
	Productivity of Hatchery Fish			Recruits/Spwnr		Fitness? [Y / N]		Recruits/Spwnr		Fitness? [Y / N]	
				10%		90%		10%		90%	
				10.0		y		10.0		y	

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SAVE

Realized Spawning Composition



⁵ Parameter values were taken directly from the AHA website but are incomplete and need to be estimated and verified.

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Table A5. Wenatchee River Summer Steelhead (Natural + Integrated Hatchery)

Biological Significance:				MEDIUM		MEDIUM		MEDIUM		MEDIUM	
Subbasin	Species	Administrator	Mgt Intent:	Harvest and Conservation		Conservation and Recovery		Conservation and Recovery		Conservation-Harvest	
Wenatchee	Summer Steelhead	Casey Baldwin	Mgt Strategy:	Habitat Protection		Hatchery Supplementation		Hatchery-Habitat Improvement		Habitat Improvements	
Wenatchee River Summer Steelhead				Historic		Before Hatchery Program		Current Hatchery Program		Short-term: 10-15 years	
Hab	[EDT] Prod. Capacity			3.58	1,883	2.50	883	2.50	883	2.70	1,590
	Min NOR Escape %Kelt			1		1	1%	1	1%	1	1%
	Smolt Prod. Capacity			230	120,938	161	56,712	161	56,712	173	102,119
Hydro	Ocean Surv	Baseline S	Vary? (Y/N)	0.085	0.016	y		0.085	0.016	y	
	Passage Surv	Juvenile	Adult	1.00	1	0.22	0.83	0.22	0.83	0.25	0.83
	Adj. Prod. Adj. Capacity			19.62	10,322	2.50	883	2.50	883	3.07	1,808
Harv	Harv-Mixed Stock			NORs	HORs						
	Harv-Terminal			NORs	HORs	0.020	0.100	0.020	0.100	0.020	0.250
	Total Exploitation Rate			NORs	HORs	0.020	0.10	0.02	0.10	0.02	0.25
Hatch	Broodstock Composition			pNOB-Goal	pHOS-Goal	pNOB		pHOS		pNOB	
				pNOB-Realized	pHOS-Realized	50%		50%		100%	
	Hatchery Type ->			[Int / Seg / None]		Local		Import		Local	
	Broodstock Numbers by Source			Local	Imported	208		400,374		208	
	Brood Exported (from HOR Surplus)			Exported Brood	Strays						
	Destination for HOR Returns			% to Hatchery	% to Nat. Spawn.	100%		25%		50%	
	Productivity of Hatchery Fish			Recruits/Spwnr	Fitness? [Y / N]	y		15.7		15.7	
						100%		75%		50%	
						y		y		y	

OPEN

SAVE

Expl. Rate → Harv. Rate

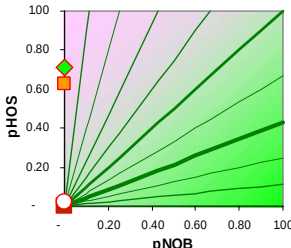
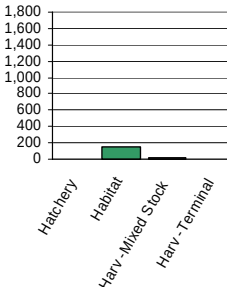
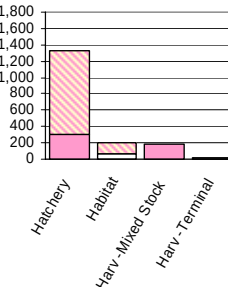
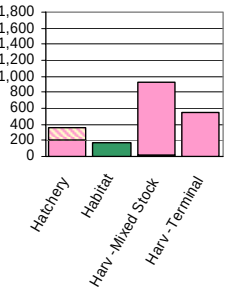
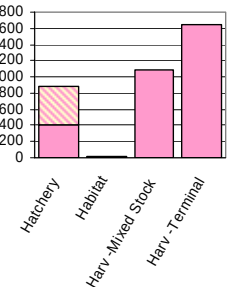
0.10	0.10
0.10	0.11
0.10	0.13
0.30	0.30

Realized Spawning Composition

USFWS Columbia Basin Hatchery Review Team

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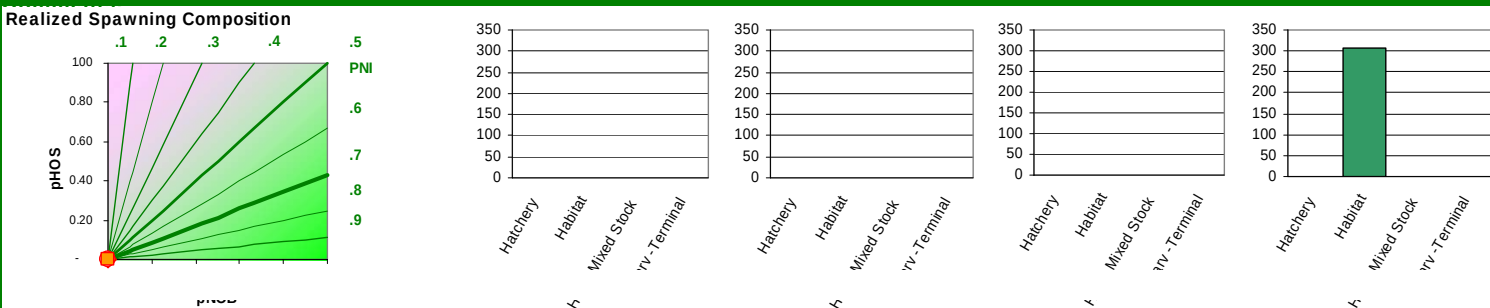
Table A6. Entiat River Spring Chinook and Entiat NFH (natural + segregated hatchery)

Biological Significance:												LOW		LOW		LOW		LOW			
Subbasin		Species		Administrator		Mgt Intent:		Conservation - Recovery		Harvest on Hatchery Fish -		Harvest on Hatchery Fish		Harvest on Hatchery Fish		Restoration-Harvest for Coho					
Entiat		Spring Chinook		Casey Baldwin		Mgt Strategy:		No Hatchery Program		Segregated Harvest Program		Summer Chinook Program		Coho Hatchery Program		Coho Hatchery Program					
Entiat River Spring Chinook - Entiat NFH				Historic		No Hatchery Program		Current Hatchery Program		Alternative 3		Alternative 2									
Hab	[EDT] Prod. Capacity		2.65		622		1.97		353		1.97		353		1.97		500				
	Min NOR Escape %Kelt		1				1				1				1						
	Smolt Prod. Capacity		399		93,675		297		53,163		297		53,163		297		75,301				
Hydro	Ocean Surv	Baseline S	Vary? (Y/N)		0.017		0.007		y		0.017		0.007		y		0.017				
	Passage Surv	Juvenile	Adult		1.00		1		0.45		0.85		0.45		0.85		0.45				
	Adj. Prod. Adj. Capacity		6.91		1,623		1.97		353		1.97		353		1.97		500				
Harv	Harv-Mixed Stock			NORs		HORs		0.110				0.110		0.110		0.110					
	Harv-Terminal			NORs		HORs								0.010		0.600					
	Total Exploitation Rate			NORs		HORs		0.110				0.11		0.12		0.11					
Hatch	Broodstock Composition			pNOB-Goal		pHOS-Goal		pNOB		pHOS		pNOB		pHOS		pNOB					
	Hatchery Type ->			pNOB-Realized		pHOS-Realized		Local		Import		Local		Import		Local					
	Broodstock Numbers by Source			[Int / Seg / None]		[Int / Seg / None]		Seg		Seg		Seg		Seg		Seg					
	Brood Exported (from HOR Surplus)			Local		Imported		298		571,584		200		380,000		400					
	Destination for HOR Returns			Exported Brood		Strays															
	Productivity of Hatchery Fish			% to Hatchery		% to Nat. Spawn.		100%		90%		10%		99%		1%					
				Recruits/Spwnr		Fitness? [Y / N]		y		5.0		y		8.0		y					
OPEN		SAVE		Realized Spawning Composition																	
Expl. Rate		Harv. Rate																			
0.10		0.10																			
0.10		0.11																			
0.10		0.13																			
0.30		0.30																			

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Table A7. Entiat River Summer Steelhead (Natural)⁶

Biological Significance:													LOW			LOW			LOW			LOW			
Subbasin		Species		Administrator		Mgt Intent:		Conservation and Harvest			Recovery and Control Stream			Recovery and Control Stream			ESA Delisting								
Entiat River		Summer Steelhead		Casey Baldwin		Mgt Strategy:		Maximize Escapement			No Hatchery Program			Habitat-Hydro Improvements			Habitat Protection								
Entiat River Summer Steelhead						Historic		Before ESA Listing			Current Status			Short-Term: 10-15 years			Long-Term: 50-75 years								
Hab	[EDT] Prod. Capacity		2.36		515		0.00		170		0.00		170		0.00		170		1.92		434				
	Min NOR Escape %Kelt		1				1				1				1				1						
	Smolt Prod. Capacity		151		33,080		0		10,887		0		10,887		0		10,887		124		27,862				
Hydro	Ocean Surv	Baseline S.	Vary? (Y/N)	0.085	0.016	y		0.085	0.016	y		0.085	0.016	y		0.085	0.016	y		0.085	0.016	y			
	Passage Surv	Juvenile	Adult	1.00		1		0.22		0.83		0.22		0.83		0.25		0.83		0.26		0.83			
	Adj. Prod. Adj. Capacity		12.92		2,823		0.00		170		0.00		170		0.00		193		2.25		507				
Harv	Harv-Mixed Stock			NORs		HORs																			
	Harv-Terminal			NORs		HORs																			
	Total Exploitation Rate			NORs		HORs																			
Hatch	Broodstock Composition			pNOB-Goal		pHOS-Goal		pNOB			pHOS			pNOB			pHOS			pNOB			pHOS		
				pNOB-Realized		pHOS-Realized																			
	Hatchery Type ->					[Int /Seg /None]		Local			Import			None			Local			Import			None		
	Broodstock Numbers by Source			Local		Imported		Smolt Release																	
	Brood Exported (from HOR Surplus)			Exported Brood		Strays																			
	Destination for HOR Returns			% to Hatchery		% to Nat. Spawn.		100%						100%						100%					
	Productivity of Hatchery Fish			Recruits/Spwnr		Fitness? [Y / N]		y						y						y					
OPEN		SAVE		Realized Spawning Composition																					
Expl Rate		Harv. Rate																							
0.10		0.10																							
0.10		0.11																							
0.10		0.13																							
0.30		0.30																							

⁶ Parameter values were taken directly from the AHA website but are incomplete and need to be estimated and verified.

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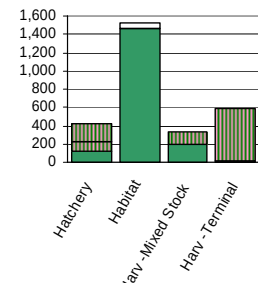
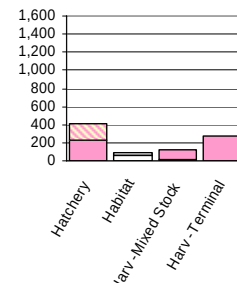
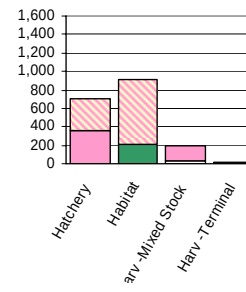
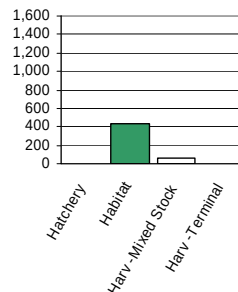
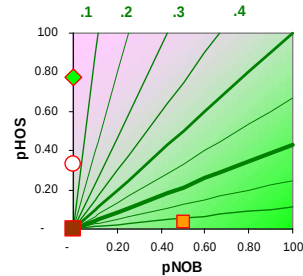
Table A8. Methow River Spring Chinook and Winthrop NFH (Natural + Integrated Hatchery)

Biological Significance:				MEDIUM		MEDIUM		HIGH		HIGH	
Subbasin	Species	Administrator	Mgt Intent:	Conservation - Recovery		Recovery-Harvest		Recovery-Harvest		Conservation-Harvest	
Methow River	Spring Chinook	Casey Baldwin	Mgt Strategy:	No Hatchery Program		Integrated Hatchery Program		Stepping Stone Broodstock		Improved Habitat	
Methow River Spring Chinook - Winthrop NFH				Historic		No Hatchery Program		Current Hatchery Program		Alternative 5	
Hab	[EDT] Prod. Capacity	4.43	2,922	1.92	1,116	1.92	1,116	1.92	1,116	3.26	2,600
	Min NOR Escape %Kelt	1		1		1		1		1	
	Smolt Prod. Capacity	265	174,358	115	66,566	115	66,566	115	66,566	195	155,131
Hydro	Ocean Surv	Baseline S	Vary? (Y/N)	0.054	0.017	y		0.054	0.017	y	
	Passage Surv	Juvenile	Adult	1.00	1	0.41	0.76	0.41	0.76	0.41	0.76
	Adj. Prod. Adj. Capacity	14.23	9,378	1.92	1,116	1.92	1,116	1.92	1,116	3.26	2,600
Harv	Harv-Mixed Stock	NORs	HORs	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110
	Harv-Terminal	NORs	HORs	0.010	0.010	0.010	0.010	0.010	0.300	0.010	0.500
	Total Exploitation Rate	NORs	HORs	0.119	0.12	0.12	0.12	0.12	0.38	0.12	0.56
Hatch	Broodstock Composition			pNOB		pHOS		pNOB		pHOS	
				pNOB-Goal		pHOS-Goal		pNOB		pHOS	
				pNOB-Realized		pHOS-Realized					
	Hatchery Type ->			[Int /Seg /None]							
	Broodstock Numbers by Source			Local	Imported	Smolt Release		Local	Import	Int	
	Brood Exported (from HOR Surplus)			Exported Brood	Strays			Local	Import	Int	
	Destination for HOR Returns			% to Hatchery	% to Nat. Spawn.			Local	Import	Int	
	Productivity of Hatchery Fish			Recruits/Spwnr	Fitness? [Y / N]			Local	Import	Int	
								Local	Import	Int	
								Local	Import	Int	

OPEN

SAVE

Realized Spawning Composition



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Table A9. Methow River Summer Steelhead and Winthrop NFH (Natural + Integrated Hatchery)

Biological Significance:				Medium		Medium		HIGH		HIGH	
Subbasin	Species	Administrator	Mgt Intent: Mgt Strategy:	Conservation Recovery Habitat Protection		Recovery-Harvest Hatchery Supplementation		Recovery-Harvest Local Broodstock		Recovery-Harvest Local Broodstock	
Methow River	Summer Steelhead	Casey Baldwin									
Methow Summer Steelhead - Winthrop NFH				Historic		No Hatchery Program		Current Hatchery Program		Alternative 2: Min.Prog.	
Hab	[EDT] Prod. Capacity	2.64	3,084	1.25	1,963	1.25	1,963	1.25	1,963	1.25	1,963
	Min NOR Escape %Kelt	1		1		1		1		1	
	Smolt Prod. Capacity	220	257,223	104	163,693	104	163,693	104	163,693	104	163,720
Hydro	Ocean Surv Baseline S	0.075	0.012	y	0.075	0.012	y	0.075	0.012	y	0.075
	Passage Surv Juvenile	1.00	1	0.18	0.88	0.18	0.88	0.18	0.88	0.18	0.88
	Adj. Prod. Adj. Capacity	16.56	19,363	1.25	1,963	1.25	1,963	1.24	1,952	1.24	1,952
Harv	Harv-Mixed Stock	NORs	HORs								
	Harv-Terminal	NORs	HORs	0.020		0.020	0.200	0.020	0.200	0.020	0.300
	Total Exploitation Rate	NORs	HORs	0.020		0.02	0.20	0.02	0.20	0.02	0.30
Hatch	Broodstock Composition			pNOB		pHOS		pNOB		pHOS	
	pNOB-Goal			pHOS-Goal		50%		50%		50%	
	pNOB-Realized			pHOS-Realized		71%		47%		43%	
	Hatchery Type ->			[Int / Seg / None]		Int		Int		Int	
	Broodstock Numbers by Source			Local	Imported	Local	Imported	Local	Imported	Local	Imported
	Brood Exported (from HOR Surplus)			Exported Brood	Strays	54	100,808	100	186,682	214	399,500
	Destination for HOR Returns			% to Hatchery	% to Nat. Spawn.						
	Productivity of Hatchery Fish			Recruits/Spwnr	Fitness? [Y / N]	100%	100%	25%	75%	50%	50%
						y	y	y	y	y	y
						5.0	y	5.0	y	5.0	y

OPEN

SAVE

Exp. Rate

Harv. Rate

0.10	0.10
0.10	0.11
0.10	0.13
0.30	0.30

Realized Spawning Composition

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U.S. Fish and Wildlife Service
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For Columbia River Basin Hatchery Review Information
www.fws.gov/pacific/Fisheries/Hatcheryreview/

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