



G. Benefit/Risk Tool

OVERVIEW

The Hatchery Scientific Review Group's (HSRG) Benefit/Risk Tool was adapted and simplified from a tool developed by the co-managers.⁶³ It allows the HSRG and the managers to evaluate the relative benefits and risks associated with specific actions and choices in hatchery management, in a scientifically sound, methodical manner. It is the vehicle by which scientists and managers can compare the best available science contained in the scientific framework⁶⁴ and the best operational practices in the operational guidelines⁶⁵ to current hatchery program purposes and operations. As such, its use in evaluating hatchery programs is key to meeting the HSRG's principle that hatcheries be operated in a scientifically defensible manner.⁶⁶

The tool has been used by the HSRG during the regional reviews and contains three worksheets. "Generic" (not specific to a region) versions of these worksheets are presented on the following pages, after a description of each worksheet and how it is used.

The HSRG understands that the terms "risk" and "benefit" are sometimes used to convey a specific legal or policy status, condition or decision about the results of a particular action, policy or program. For the purposes of the HSRG's review and recommendations, these terms are not being used in this manner, but rather in the general sense of whether a hatchery program, or some aspect of that program, is likely to be affecting one or more regional salmonid stocks in a positive and/or negative way. The intent is to provide policy makers with a sense of the trade-offs involved in different options or courses of action.

Part One

The Part One worksheet is titled *Summary of Goals for Affected Stocks and Habitat; Description of Current Hatchery Programs*. It is where the HSRG records the results of working with the regional participants to develop a common understanding of the current status of each regional hatchery program's purpose, type and release strategies. The participants also use this worksheet to rate current, short-term and long-term goals for each regional stock, in terms of biological significance, population viability, habitat and harvest opportunity. Each category is rated as being high, medium or low. The following definitions are used for these ratings.

⁶³ Draft Benefit-Risk Assessment Procedure (BRAP) for Washington State Department of Fish and Wildlife Artificial Propagation Programs, November 17, 2000.

⁶⁴ See Appendix A, *Scientific Framework for the Artificial Propagation of Salmon and Steelhead*.

⁶⁵ See Appendix C, *Operational Guidelines*.

⁶⁶ See *Applied Hatchery Reform, Principles and System-Wide Recommendations*.

***Definition of Population Biological Significance***

Rating criteria and scores for evaluating the biological significance of salmon and steelhead populations as part of assessing the benefits and risks of hatchery programs in Puget Sound and coastal Washington:

- A. Stock origin (possible scores = 1-5)
 - a. Native (Score = 5)
 - b. Admixture
 - i. >50% native genes (Score = 4)
 - ii. <50% native genes (Score = 3)
 - c. Reintroduced: species occurred historically in watershed, was extirpated, but stock transfers re-established species in watershed (Score = 2)
 - d. Introduced: species was historically absent from watershed/habitat (Score = 1)

[What data/information do we need to obtain a stock origin score?, What/who are the sources for that info?]

- B. Biological attributes (Life history, physiological, morphological and behavior characters; disease resistance, etc.): How unique are these characters and to what extent are they irreplaceable (possible scores = 1-5)
 - a. Population has unique, irreplaceable biological attributes that are not shared with other SASI stocks within the GDU (Score = 5)
 - b. Has no unique biological attributes, but shares some unique attributes with other SASI stocks within the GDU that are not shared with other GDUs (Score = 3)
 - c. Key biological attributes are shared with other GDUs (Score = 1).

[What data/information do we need to obtain a biological attributes score? What/who are the sources for that info?]

- C. Level of population subdivision or metapopulation structure (scores = 1-7)
 - a. Number of distinct spawning aggregations (e.g. tributaries) within the SASI stock under consideration:
 - i. <5: Score = 2
 - ii. >5: Score = 1
 - b. Total number of SASI stocks within the same GDU:
 - i. < 3: Score = 2
 - ii. > 3: Score = 1
 - c. Viability of other SASI stocks within the same GDU:



- i. Mean viability = “High”, Score = 1
- ii. Mean viability = “Medium”, Score = 2
- iii. Mean viability = “Low or no other SASI stocks within GDU, Score = 3.

[What data/information do we need to obtain a biological attributes score? What/who are the sources for that info?]

Sum of scores and biological significance ratings (A + B + C):

5-8 = **Low**

9-13 = **Medium**

14-17 = **High**

Definition of Population Viability

Rating criteria and scores for evaluating the viability of salmon and steelhead populations as part of assessing the benefits and risks of hatchery programs in Puget Sound and coastal Washington:

Ne: Effective population size (estimated from known estimated numbers of spawners per year and generation time) Worksheet to be developed. (possible scores = 1-5)

$N_e < 100$	Score = 1
$100 < N_e < 500$	Score = 2
$500 < N_e < 2,500$	Score = 3
$2,500 < N_e < 5,000$	Score = 4
$N_e > 5,000$	Score = 5

Mean numbers of recruits per spawners (R/S) over preceding 10 years

a. $R/S > 5$	Score = 5
b. $3 < R/S < 5$	Score = 4
c. $2 < R/S < 3$	Score = 3
d. $1 < R/S < 2$	Score = 2
e. $R/S < 1$	Score = 1

Proportion of natural spawners comprised of hatchery-origin fish (possible score = 1-4)

< 1 %	Score = 4
1 – 5 %	Score = 3



5-30%	Score = 2
>30%	Score = 1

For hatchery populations, this latter criterion would be changed to Proportion of eggs, fry or adults from wild fish or another hatchery:

f. <1%	Score = 4
g. 1-5 %	Score = 3
h. 5-30 %	Score = 2
i. > 30%	Score = 1

Sum of scores and population viability ratings:

3-6	Critical
7-10	At Risk
11-13	Healthy

Definition of Population Habitat Conditions

Three categories of environment, habitat (e.g., watershed), are defined in terms of conditions that support the target species (i.e., Chinook salmon) with the assumption that these conditions would also provide for the needs of other native species of salmonids (these definitions implicitly assume that any pre-terminal harvest is part of the environment during the fish’s whole life cycle).

1. **High** = Healthy: Productivity of the target species is high, everywhere and at all times, and the population is capable of growth and terminal harvest.
2. **Medium** = Limiting: The target species is productive enough for the population to sustain itself at a low level of harvest.
3. **Low** = Inadequate: The target species is unproductive and the population will go extinct, even without terminal harvest.

Habitats are characterized by Quality (HQ1), Quantity (HQ2), and Diversity (HD). An illustration of how these categories might be quantified suggests that a characterization of “Healthy” would require that HQ1 and HQ2 would combine such that the productivity of the population (recruits per spawner uninhibited by density, or some other measure) is greater than 5 and that the population has an abundance potential of 5,000 spawners. A categorization of “healthy” would require that HD is sufficient to support a variety of life history patterns (e.g., diverse smolt ages, emigration timing, a range of run timings, a range of spawning locations.)

A characterization of “Limiting” would require that HQ1 and HQ2 would combine such that the productivity of the population is at least 2, the population has an abundance potential of at least



500 spawners, and HD is restricted, supporting only a uniform age and size of smolts, a short duration of run timing, and a limited location for spawning.

Definition of Harvest Goals

High – harvest opportunity each year, spread over seasons

Medium – opportunity most year, for some seasons

Low – occasional opportunity, single run

0 – no harvest opportunity

Definition of Other Goals:

Educational

Cultural (ceremonial, first fish...)

Employment

Research

Program Purpose and Type

The **purpose** of the hatchery program is defined as either *conservation*, *harvest*, *both* and/or another purpose (such as *education*, *research* or *cultural/ ceremonial*).

The **type** of program is also included. Hatchery programs are classified as *integrated* if the goal is to minimize potential genetic divergence between the hatchery broodstock and the naturally-spawning population in the watershed where fish are released and returning adults trapped for broodstock. *Segregated* programs are classified as those in which the goal is to maintain the hatchery population as a distinct, or genetically segregated population.

Part Two

The Part Two worksheet is entitled *How Current Program Operations Compare to HSRG Operational Guidelines*. It is where the HSRG records the results of working with regional hatchery managers to understand current operations at the region's hatcheries. The HSRG then evaluates how these current operations compare to the "best practices" outlined in the HSRG's operational guidelines. The four areas considered in this evaluation are: 1) Culture Methods, 2) Accountability/Education, 3) Physical/Morphological/Ecological, and 4) Genetics/Conservation.



Part Three

The Part Three worksheet is entitled *Benefit/Risk Analysis; Recommendations and Alternatives*. Using the Part Three worksheet, the HSRG assesses the benefits and risks derived from each regional hatchery program on both the target stock and every other regional stock. This analysis leads to the group's scientific conclusions, which are recorded on the second half of the worksheet.



"GENERIC" BENEFIT/RISK TOOL WORKSHEETS

[See following pages]

Benefit-Risk Tool - Part 1. Summary of Goals for Affected Stocks and Habitat and Description of Current Hatchery Program for Region X

Stock	Goals				Current Hatchery Program		
	Category	Now	Short-Term	Long-Term	Program Type (S = Segregated, I = Integrated, B = Both)	Program Purpose (C = Conservation, H = Harvest, B = Both)	Program Description
Sub-region							
Stock A	BioSig						
	Viabil						
	Habitat						
	Harvest						
Stock B	BioSig						
	Viabil						
	Habitat						
	Harvest						
Stock C	BioSig						
	Viabil						
	Habitat						
	Harvest						
etc.	BioSig						
	Viabil						
	Habitat						
	Harvest						

Benefit-Risk Tool - Part 2: Operational Guidelines Questions Related to Genetics and Conservation for Region X.

Question applies to:			Operations questions derived from conditions for success in HSRG Framework Sections 1.1, 2.3 and 3.1 (Genetics and Conservation)	Answers to Operations Questions: (Y = Yes, N = No, I = Insuf. Info, NA = Not Applicable)					
Program Type (S = Segregated, I = Integrated, B = Both)	Program Purpose (C = Conservation, H = Harvest, B = Both)	Not Applicable To: (SH =Segregated/ Harvest, SC = Segregated/ Conservation)		Program A		Program B		etc.	
				Type	Purpose	Type	Purpose	Type	Purpose
Broodstock Choice									
B	B		1. Is the hatchery stock native to the watersheds in which it is released?						
I	B		3. Have eggs or adults been introduced from outside the watershed since inception of the hatchery program?						
Broodstock Collection									
B	B		4. Are adults randomly selected among all returning adults?						
B	B		5. Were sufficient numbers of donors collected from the natural stock to minimize founder effects when the program was initiated?						
B	B		6. Are sufficient broodstock collected to maintain an effective population size of 1000 fish per generation? (How many males and females do you typically spawn?)						
I	B		7. If goal is to minimize genetic divergence, are at least 10% of the broodstock derived from wild fish each year? (How many wild fish do you incorporate into your broodstock each year?)						
I	C		8. If the wild population has 150 fish or more, is collection of wild broodstock limited to 30% of the population?						
B	B		9. Has any backfilling of egg shortages occurred in the recent past?						
B	B		10. Does pre-spawning mortality exceed 10%?						
B	B		11a) Do you have guidelines for acceptable contribution of hatchery origin fish to natural spawning? What do you do with surplus adults?						
B	B		11b) Are guidelines for hatchery contribution to natural spawning met for all affected naturally spawning populations? What do you do with surplus adults?						
I	C		13 b) Is a composite of naturally spawned and hatchery-bred fish spawning in the wild?						
I	B		13 d) Is the proportion of naturally spawning fish that are of hatchery origin known? If so, is it controlled?						
I	B		13 e) Is the composition of hatchery and wild fish in the broodstock known and controlled?						
B	B		14. Is the necessary security of the stocks maintained?						
I	C		16. Is the duration of the program clearly defined?						

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Program Type (S = Segregated, I = Integrated, B = Both)	Program Purpose (C = Conservation, H = Harvest, B = Both)	Not Applicable To: (SH =Segregated/ Harvest, SC = Segregated/ Conservation)		Program A		Program B		etc.			
				Type	Purpose	Type	Purpose	Type	Purpose		
Spawning											
B	B		17. Are males and females available for spawning on a given day randomly mated?								
B	B		18. Do fish selected for broodstock have an equal opportunity to make a genetic contribution to the progeny gene pool? (How are eggs fertilized? Pairwise? Overlapping pairwise?, modified matrix? Etc.)								
I	B		19. Does the hatchery program include any natural spawning?								
Incubation											
I	B		20. Are full sib families incubated separately? (Are eggs from a single female incubated separately?)								
I	B		23. Are water sources used that match the hatching/emergence timing of naturally produced populations?								
Rearing											
I	B		28. Are fish reared under conditions that maximize the probability that all segments of the population contribute equally to the release population? (Is size grading practiced? If so, are slower growing fish culled?)								
B	B		29. Are all fish reared under environmental conditions that tend to maximize survival of all segments of the population? (Is growth modulation practiced?)								
B	B		31. Are excess juveniles culled randomly when necessary?								
I	B		33. Are the fish produced similar to natural fish in size, growth rate, morphology, behavior, physiological status, health, etc?								
B	B		34. Are fish reared under conditions that maximize homing fidelity?								
B	C		35. Are fish reared in multiple facilities or with redundant systems to reduce the risk of catastrophic loss?								
I	C		37. Are fish reared for the shortest period possible?								
B	C		40. Are families reared individually to maintain pedigrees?								
I	B		41. If required, are larger families culled to minimize family size variation?								

Benefit-Risk Tool - Part 2: Operational Guidelines Questions Related to Genetics and Conservation for Region X.

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				Type	Purpose	Type	Purpose	Type	Purpose
Release									
B	B		42. Are fish released at life stages and locations that maximize homing fidelity?						
I	B		43. For a given release date and location, are fish similar to the natural population in size, morphology, behavior, physiological status, health?						
I	B		44. Is volitional release practiced during the natural out-migration timing?						
B	B		45. Are marking/tagging techniques used to distinguish among segments of the hatchery population and between the hatchery and natural populations?						
I	C		46. Are fish identified with nonlethal detectable identification marks or tags?						
Adult migration									
B	H		47. Is the straying of hatchery fish into the wild controlled?						
S	H		48. Is the attraction of wild fish into the hatchery minimized?						
B	B		49. Are hatchery fish identified so the status of the natural population is not masked?						

Benefit-Risk Tool - Part 2: Operational Guidelines Questions Related to Physiology, Morphology, and Ecology for Region X.

Question applies to:			Operations questions derived from conditions for success in HSRG Framework Sections 1.2.1-1.2.3, 2.1, 2.2, 2.2.4 (Physiology, Morphology, and Ecology)	Answers to Operations Questions: (Y = Yes, N = No, I = Insuf. Info, NA = Not Applicable)					
Program Type (S = Segregated, I = Integrated, B = Both)	Program Purpose (C = Conservation, H = Harvest, B = Both)	Not Applicable To: (SH =Segregated/ Harvest, SC = Segregated/ Conservation)		Program A		Program B		etc.	
Type	Purpose	Type		Purpose	Type	Purpose	Type	Purpose	
Broodstock Choice									
B	B	SH	1. Is the broodstock local or locally adapting?						
I	B		2. Does the broodstock chosen for initiating hatchery programs represent populations native or adapted to the watersheds in which they will be released?						
S	H		3. Does the broodstock chosen minimize negative ecological interactions?						
Broodstock Collection									
B	B	SH	4. Are representative samples of the adult population collected with respect to size, age, sex ratio or other traits important to long term fitness?						
B	B	SH	5. Are broodstock maintained on natural water temperature profiles to provide optimum maturation and gamete development?						
B	B		6. Does the number of broodstock collected maintain program size within carrying capacity of the natural environment?						
B	B		7. Are adult fish or carcasses provided for upstream planting?						
Spawning									
			<i>None</i>						
Incubation									
I	B		8. Does the program use water sources to match hatching/emergence timing of naturally produced population?						
B	B		9. Does the number of eggs incubated maintain program size within the carrying capacity of the natural environment?						
Rearing									
B	B	SH	10. Does the program use a diet and growth regime that mimics natural growth patterns?						
I	B		11. Are natural rearing conditions simulated for temperature, photoperiod, hydraulic characteristics, feeding conditions, and predator avoidance?						
B	B		12. Are adequate flows maintained in the by-pass reach?						
B	B		13. Has a riparian management plan been implemented that incorporates vegetation management, herbicide and pesticide use, and surface water management provisions?						
B	B		14. Does the facility operate within the limitations established in National Pollution Discharge Elimination System permit?						
B	B		15. Has an on or off-site habitat mitigation plan been implemented?						
B	B		16. Does the number of fish reared maintain program size within carrying capacity of the natural environment?						
I	B		17. Are the fish produced qualitatively similar to natural fish in size, morphology, behavior, physiological status, health, and other attributes?						
I	B		18. Are natural juvenile rearing conditions simulated for rearing density, temperature, hydraulic characteristics, habitat complexity, feeding conditions, and predator avoidance behavior?						
B	B	SC	19. Are fish reared under conditions that maximize homing fidelity?						

Benefit-Risk Tool - Part 2: Operational Guidelines Questions Related to Physiology, Morphology, and Ecology for Region X.

Question applies to:			Operations questions derived from conditions for success in HSRG Framework Sections 1.2.1-1.2.3, 2.1, 2.2, 2.2.4 (Physiology, Morphology, and Ecology)	Answers to Operations Questions: (Y = Yes, N = No, I = Insuf. Info, NA = Not Applicable)					
Program Type (S = Segregated, I = Integrated, B = Both)	Program Purpose (C = Conservation, H = Harvest, B = Both)	Not Applicable To: (SH =Segregated/ Harvest, SC = Segregated/ Conservation)		Program A		Program B		etc.	
Type	Purpose	Type		Purpose	Type	Purpose	Type	Purpose	
Release									
I	B		20. Are fish released within the size range of naturally produced fish from which the hatchery population is derived?						
I	B		21. Are volitional releases during natural out-migration timing practiced?						
Type 1 Interactions – Hatchery/natural fish -- Predation (Inter and intra-specific)									
I	B	SC	22 a. Are fish released at sizes and life history stages similar to those of natural fish of the same species?						
B	B	SC	22 b. Are fish released in areas or at life history stages where they are unlikely to encounter or prey upon natural fish of the same or other species?						
B	B	SC	22 c. Are fish released in a manner so they are unlikely to encounter or prey upon natural fish of the same or other species?						
B	B	SC	22 d. Are fish released in numbers that do not exceed the carrying capacity for the natural population?						
B	B	SC	22 e. Are fish released in stream reaches within the historic range of that species?						
B	B	SC	22 f. Are fish released in a manner that simulates natural migratory patterns?						
B	B	SC	22 g. Are fish released in areas with adequate imprinting to the facility or desired stream reach?						
B	B	SC	23 a. Are fish released at locations where they are unlikely to encounter natural fish that are negatively affected by hatchery fish?						
B	B	SC	23 b. Are fish released in numbers that do not exceed the carrying capacity of the natural environment?						
B	B	SC	23 c. Are fish released at sizes and life history stages similar to those of natural fish of the same species?						
Type 2 Interactions – Adult Returns & offspring of hatchery fish/natural fish									
B	B	SC	24 a. Are fish released in areas with adequate imprinting to facility or desired stream reach?						
I	B		24 b. Are fish released in numbers that do not exceed the carrying capacity of the natural environment?						
B	B	SC	24 c. Are fish released into properly functioning freshwater, estuarine and marine habitat?						
Adult migration									
B	B	SC	25. Is unimpeded passage provided for wild fish through hatchery structures and by-pass reaches?						
B	B	SC	26. Does the hatchery operate to allow all migrating species of all ages to pass through hatchery related structures to maximize use of natural habitat?						
I	B		27. Are adults distributed upstream of hatchery to meet habitat capacity?						

Benefit-Risk Tool - Part 2: Operational Guidelines Questions Related to Culture Methods for Region X.

Question applies to:			Operations questions derived from conditions for success in HSRG Framework Sections 1.2.4, 1.3, and 3.2 (Culture Methods)	Answers to Operations Questions: (Y = Yes, N = No, I = Insuf. Info, NA = Not Applicable)					
Program Type (S = Segregated, I = Integrated, B = Both)	Program Purpose (C = Conservation, H = Harvest, B = Both)	Not Applicable To: (SH =Segregated/ Harvest, SC = Segregated/ Conservation)		Program A		Program B		etc.	
				Type	Purpose	Type	Purpose	Type	Purpose
Broodstock Choice									
S	H		1. Does the broodstock chosen have a history of no pathogens?						
B	B		2. Is the broodstock indigenous to the watershed?						
S	H		3. Does the broodstock chosen or developed have the desired life history traits to meet harvest goals?						
Broodstock Collection									
B	B		4. If broodstock choice is from another drainage, are eggs preferentially transferred? Are fish or eggs held in quarantine as described in the Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State (disease control policy).						
B	B		5. Are broodstock maintained on pathogen-free and/or fish-free water supply?						
B	B		6. Does attending fish pathologist monitor and recommend treatments to maximize survival as needed?						
B	B		7. Are pre-spawning mortalities disposed of in a manner that prevents pathogen transmission to the receiving watershed?						
B	B		8. Are disinfection procedures implemented that prevent pathogen transmission between stocks of fish on site?						
B	B		9. Are species-specific holding recommendations followed for water quality, flows, temperature, and density?						
B	B		10. Is the broodstock collected and held in a manner that minimizes prespawning mortality?						
Spawning									
B	B	SC	11. Is a minimum effective population size of 1000 fish per generation maintained?						
B	B		12. Is pathogen sampling at spawning sufficient to provide quantitative and qualitative information for needed pathogen control measures that may be necessary for resultant transfers or rearing of progeny?						
B	B		13. Are eggs water-harden in iodophor solution as described in the disease control policy?						
B	B		14. Are carcasses disposed of in a manner that prevents pathogen transmission to the receiving watershed?						
B	B		15. Is spawning waste collected and disinfected prior to discharge to receiving water?						
B	B		16. Are disinfection procedures implemented that prevent pathogen transmission between stocks of fish on site?						

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				Type	Purpose	Type	Purpose	Type	Purpose
Incubation									
B	B		17. Does incubation occur on pathogen-free and/or fish-free water supply?						
B	B		18. Are species-specific incubation recommendations followed for water quality, flows, temperature, substrate, or density parameters to prevent syndromes such as “gas bubble disease”, “cold water disease”, “blue sac”, etc.)?						
B	B		19. Are eggs monitored when needed to determine fertilization efficiency and embryonic development?						
B	B		20. Are incubating eggs treated when recommended by attending fish pathologist?						
B	B		21. Following eye-up stage, are eggs inventoried, dead or undeveloped eggs removed, and disinfected as described in the disease control policy?						
B	B		22. Are eggs (dead or culled) discarded in a manner that prevents pathogen transmission to the receiving watershed?						
B	H		23. Are fry removed from incubation units when 80-90% of observed fry have yolk-sac material that is 80-90% utilized and contained within body cavity (“button-up”)?						
B	B		24. Are disinfection procedures implemented that prevent pathogen transmission between stocks of fish on site?						
B	B		25. Are appropriate water temperature profiles maintained to provide optimum embryo development?						
B	B		26. Are incubator loading and densities maintained at levels that ensure optimum survival of eggs and fry?						
B	B		27. Is substrate used to promote suitable fry distribution, optimum size, and appropriate emergence timing?						

Benefit-Risk Tool - Part 2: Operational Guidelines Questions Related to Culture Methods for Region X.

Question applies to:			Operations questions derived from conditions for success in HSRG Framework Sections 1.2.4, 1.3, and 3.2 (Culture Methods)	Answers to Operations Questions: (Y = Yes, N = No, I = Insuf. Info, NA = Not Applicable)					
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				Type	Purpose	Type	Purpose	Type	Purpose
Rearing									
B	B		28. Does rearing occur on pathogen-free and/or fish free water supply?						
B	B		29. Are species-specific recommendations followed for water quality, flows, temperature, or density parameters to reduce adverse stress and related pathogens and/or disease syndromes?						
S	H		30. Are facility and species-specific recommendations for water quality, temperature, loading, and density followed to maximize recruitment to fisheries?						
B	B		31. Are settleable solids, unused feed and feces periodically removed to ensure proper cleanliness of rearing container?						
B	B		32. Are mortalities removed daily and disposed of in a manner that prevents pathogen transmission to the receiving watershed?						
B	B		33. Are fish health examinations performed at a minimum of once per month and more frequently when required?						
B	B		34. Whenever possible, are vaccines used to minimize the use of antimicrobial compounds?						
B	B		35. Are fish treated with appropriate chemicals or drugs as recommended by fish pathologist?						
B	B		36. Does the operator follow proper feeding rates, conduct periodic feed quality analysis, and store feed under proper conditions to prevent nutritional disorders?						
B	B		37. Are disinfection procedures implemented that prevent pathogen transmission between stocks of fish on site?						
S	B		38. Are predators excluded from ponds to prevent the spread of pathogens between containers?						
B	B		39. In the event of an epizootic, are: Treatment recommendations of attending pathologist followed? Are affected containers isolated? Is effluent sanitized if possible?						
B	B		40. Are appropriate physical and chemical characteristics of water inflow and effluent (suspended solids, temperature, dissolved gases, pH, mineral content, and potential toxic metals) maintained to promote growth and survival?						
B	B		41. Are accurate fish inventory data maintained (e.g. Hat-Pro) with a minimum of handling stress?						
B	B		42. Are appropriate flow and density indexes maintained for the species and life stage being reared?						
B	B		43. Is the correct amount and type of food provided to achieve the desired growth rate, body composition, and condition factors for the species and life stage being reared?						
I	B		44. Do the hatchery populations exhibit growth rates, body composition and condition factors similar to natural populations?						

Benefit-Risk Tool - Part 2: Operational Guidelines Questions Related to Culture Methods for Region X.

Question applies to:			Operations questions derived from conditions for success in HSRG Framework Sections 1.2.4, 1.3, and 3.2 (Culture Methods)	Answers to Operations Questions: (Y = Yes, N = No, I = Insuf. Info, NA = Not Applicable)					
Program Type (S = Segregated, I = Integrated, B = Both)	Program Purpose (C = Conservation, H = Harvest, B = Both)	Not Applicable To: (SH =Segregated/ Harvest, SC = Segregated/ Conservation)		Program A		Program B		etc.	
				Type	Purpose	Type	Purpose	Type	Purpose
Release									
B	B	SC	45. Are all fish examined for presence of "reportable pathogens" as defined in the disease control policy at the assumed pathogen prevalence Level (APPL) of 5% no less than 3 weeks prior to release?						
B	B	SC	46. Are attending fish pathologist recommendations followed for treatments prior to release?						
B	B	SC	47. Are fish released in same drainage as rearing facility?						
B	B		48. Are transfers out of drainage inspected as above and accompanied by appropriate notifications to responsible/regulatory parties as described in the disease control policy?						
B	B	SC	49. Are fish released at times of the year and sizes to allow adoption of multiple life history strategies?						
S	H		50. Are fish released at a time, size, location, and in a manner that maximizes recruitment to fisheries?						
B	B	SC	51. Are releases consistent with the ability of the habitat (freshwater, estuarine, and marine near-shore and off-shore) to support the number and life stage being released?						
Post Release and Adult migration									
B	B	SC	52. Are fish released into properly functioning habitats?						
B	B	SC	53. Are the number of fish released compatible with habitat carrying capacity?						
B	H		54. Is sufficient water flow provided to attract and separate adults into hatchery?						

Benefit-Risk Tool - Part 2: Operational Guidelines Questions Related to Accountability and Education for Region X.

Question applies to:			Operations questions derived from conditions for success in HSRG Framework Sections 3.3, and 4 (Accountability and Education)	Answers to Operations Questions: (Y = Yes, N = No, I = Insuf. Info, NA = Not Applicable)					
Program Type (S = Segregated, I = Integrated, B = Both)	Program Purpose (C = Conservation, H = Harvest, B = Both)	Not Applicable To: (SH =Segregated/ Harvest, SC = Segregated/ Conservation)		Program A		Program B		etc.	
				Type	Purpose	Type	Purpose	Type	Purpose
Accountability									
B	B		1. Are all hatchery personnel aware of the goals for the hatchery with respect to conservation, harvest and other purposes?						
B	B		2. Are expenditures tracked to assure that funds are expended as intended for the hatchery program?						
B	B		3. Are KEY staff aware of the funding available for carrying out the various activities in the production cycle so that it can be done the most cost effective manner?						
B	B		4. Is all new relevant information from research or other sources made available to hatchery staff and others and used for attaining goals?						
B	B		5. Is the most recent information obtained from monitoring and evaluation programs for the production cycle, including performance indicators and progress toward goals, taken into consideration when determining whether hatchery operations should be changed or not?						
B	B		6. Is there a management program in place that assures that information pertaining to items 1-4 is available on a "real-time" basis and that changes warranted by that information are implemented?						
B	B		7. Are standards specified for in-culture and post release performance of hatchery fish and their offspring?						
B	B?		8. Are there state or federal laws that constrain the program by specifying objectives, such as numbers and size of smolt produced?						
Education									
Hatchery Operations									
B	B		9. Is the hatchery facility open to the public during hours of operation?						
B	B		10. Are the hatchery operations visible to facility visitors?						
B	B		11. Are hatchery operations (egg take, incubation, rearing) demonstrated to the public?						
B	B		12. Does the facility have a fish ladder and/or adult holding facilities that are open to the public?						
Hatchery Physical Plant									
B	B		13. Does the hatchery have signage describing the facility, fish production goals, ties to management goals, ecosystem function?						
B	B		14. Is there a visible link to riparian zone such as viewing boardwalk or bridge?						
B	B		15. Is the facility used by other fish and wildlife programs?						
B	B		16. Does the hatchery schedule tours for groups?						
Educational Outreach Programs									
B	B		17. Does the program provide opportunities for student interns?						
B	B		18. Does the program provide opportunities for citizen volunteer involvement?						
B	B		19. Does the agency maintain a web page describing the hatchery program?						
B	B		20. Is a pamphlet or brochure describing agency or hatchery programs available?						
Hatchery Program									
B	B		21. Are eggs or fish provided to volunteer groups?						
B	H?		22. Are eggs or fish provided to educational groups i.e. "Salmon in the Classroom"?						
Hatchery Staff									
B	B		23. Is hatchery staff involved in community/volunteer meetings or outreach programs?						
B	B		24. Does hatchery staff regularly give classroom presentations?						
B	B		25. Does hatchery staff participate in formal professional presentations/seminars?						
Formal Research									
B	B		26. Is the facility used or does staff participate in agency research projects?						
B	B		27. Is the facility used or does staff participate in university or other cooperative research projects?						
B	B		28. Are data and information pertaining to the program accessible to interested researchers?						

Benefit-Risk Tool - Part 3. Benefit/Risk Analysis; Recommendations and Alternatives for Program Y

Potentially Affected Stocks	Benefits/Risks Evaluated: Program Y, Region X	
	For each potentially affected stock, identify a) significant benefits to, and b) major conflicts with...	
	Benefits	Risks
Sub-region		
Stock A		
Stock B		
Stock C		
etc.		
Hatchery Program Recommendations: Program Y, Region X		
Life Stage	Operations	Monitoring
Broodstock Choice		
Broodstock Collection		
Spawning		
Incubation		
Rearing		
Release		
Post Release		
Adult Migration		
General Comments - Alternative Programs for Consideration – Different Facility and Production Solutions, etc,		
Program and Facilities		Monitoring
Operations		Accountability