Hatchery Effects Appendix

May 5, 2008

Hatchery Effects Report for Protected Salmon & Steelhead of the Interior Columbia Basin

July 21, 2006

Working Paper of the FCRPS Remand Hatcheries & Harvest Working Group

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Attachment 1

1. Introduction

Securing the future of salmon and steelhead continues to be a substantial challenge. For the Interior Columbia Basin, including the Columbia River Gorge, seven of nine distinct groups of salmon and steelhead and parts of four more (i.e., Lower Columbia Chinook, coho salmon, steelhead, Columbia River chum salmon) are at risk of extinction and protected under the Federal Endangered Species Act (NMFS 2005a, and NMFS 2006a). Interests from all over Idaho, Oregon, and Washington are collaborating to reach a shared vision for salmon and steelhead recovery and to develop widespread support for addressing the factors limiting their survival. This report is intended to inform and support these collaborative efforts.

In the Interior Columbia, hatcheries are used as mitigation or compensation for factors limiting salmon and steelhead viability. Over many years, authorization to build and operate water development projects has included obligations to also fund hatchery mitigation or compensation. More than 95 percent of the hatchery programs from Bonneville Dam upriver are funded annually by Federal, Public Utility, and Private Utility dollars. In general, these programs have been called on to either (1) compensate for areas taken out of salmon and steelhead production altogether (e.g., the Leavenworth, Entiat, and Winthrop National Fish Hatcheries are compensation for Grande Coulee Dam blocking fish passage to at least half of the area producing upper Columbia spring Chinook salmon and steelhead), (2) compensate for losses because of reduced salmon and steelhead productivity from the continuing operation of dams, (3) preserve genetic resources until productivity improves and salmon and steelhead can become self-sustaining, or (4) help re-colonize areas or jumpstart production when productivity improves sufficiently and salmon and steelhead can become self-sustaining. Hatchery programs alone cannot mitigate by promoting salmon and steelhead recovery in lieu of addressing the factors limiting salmon and steelhead productivity.

Incidental to fulfilling their mitigation obligations, hatchery programs can benefit or harm the viability of salmon and steelhead. The presence of hatchery fish potentially can benefit the overall status of salmon and steelhead by contributing to increasing the number of natural spawners and spatial distribution, by serving as a source population for repopulating unoccupied habitat and by conserving genetic resources (NMFS 2005a). Conversely, hatchery-induced genetic change can reduce the fitness of both hatchery and natural-origin fish in the wild (Ford et al. 2002) and hatchery induced ecological effects (e.g., competition for food and space) can reduce salmon and steelhead productivity and abundance. Salmon and steelhead that are partially or wholly dependent on hatchery propagation for their continued existence are not viable (McElhany et al. 2000).

More than one hundred hatchery programs operate in the Columbia Basin above Bonneville Dam; this report: (1) summarizes the major factors limiting salmon and steelhead recovery at the population scale, (2) provides an inventory of existing hatchery programs including their funding source and the status of their regulatory compliance under the Endangered Species Act (ESA) and under the National Environmental Policy Act (NEPA), (3) describes the effects on salmon and steelhead viability (positive, negative, no effect or unknown) from current hatchery operations, including programs not in the same vicinity, and (4) identifies new opportunities or changes in hatchery programs likely to benefit viability. The report focuses on hatchery

programs that are associated with salmon and steelhead protected under the ESA (e.g., all spring Chinook salmon hatchery programs located within the geographical boundaries of the Upper Columbia spring Chinook Evolutionarily Significant Unit).

The primary criteria for determining the viability of salmon and steelhead populations are described in McElhany et al. (2000). These criteria are the abundance, productivity, spatial distribution and diversity of natural-origin fish. Hatchery programs can benefit or harm salmon and steelhead viability. In determining the effects (positive or negative) of hatchery programs on salmon and steelhead viability, it is necessary then to determine their influence on these criteria. It is also is important to recognize that a single hatchery effect can and often does influence multiple viability criteria. For example, increases in natural-origin fish (NOF) attributable to a hatchery program can benefit both abundance and spatial structure while, on the other hand, the removal of NOF for hatchery broodstock reduces abundance and can reduce productivity also. Ultimately, the number, nature, and scale of hatchery programs must be consistent with the maintenance of a naturally self-sustaining ESU or steelhead DPS.

The following guidance is intended to help determine the influence of hatchery programs on each of the different viability criteria.

Abundance is the number of fish produced by natural processes that have spent their entire life cycle in nature (i.e., natural-origin fish). This is often referred to as gravel-to-gravel survival or fish originating from naturally spawning parents that hatch in a stream's gravel and that survive to spawn naturally themselves years later. The effect of a hatchery program on salmon and steelhead abundance should be determined by:

1. The proportion of natural-origin fish (NOF) removed from any population or spawning aggregate to provide hatchery broodstock (i.e., NOF that are taken into a hatchery instead of left to spawn naturally). This is often referred to a "mining" a group of fish for broodstock.
2. The proportion of NOF killed or injured by hatchery facilities (e.g., hatchery water intakes).
3. Reduced or lost natural production caused by hatchery facilities that block, delay, or impede adult fish from returning to spawning areas (e.g., weirs, ladders, or traps).
4. Increases in NOF attributable to hatchery supplementation. Eggs and juveniles planted into streams and adult returns from these plants, serve to seed freshwater spawning and rearing areas. Only the progeny of naturally spawning fish (natural-origin and hatchery-origin) count in determining abundance for viability purposes.
5. Injury or mortality of adult NOF at hatchery facilities (i.e., physical injury, handling effects etc.).

Productivity is the survival rate of natural-origin fish as related to parent run size. It is a measure that directly relates to the potential ability for a population or spawning aggregate to be self-sustaining. For example, the productivity measure used by the Interior Columbia Technical Recovery Team is expressed in terms of recruits per spawner or the degree to which natural

spawning adults in one generation are replaced by natural-origin natural spawning adults in the next generation. This measure of life-cycle productivity is affected by mortality and survival at all life stages taken together. In general, if productivity is limited by the number of natural spawners (e.g., fish have difficulty finding mates or habitat is being re-colonized), then naturally spawning hatchery fish potentially can increase natural productivity. The effect of a hatchery program on salmon and steelhead productivity should be determined by:

1. The productivity of fish derived from hatchery-origin fish (i.e., the life-cycle survival or replacement rate of progeny of naturally spawning hatchery-origin fish).
2. The productivity of the progeny of naturally spawning hatchery-origin fish (HOF) relative to naturally spawning NOF.
3. The life history characteristics of naturally spawning HOF compared to naturally spawned NOF (e.g., age-of-return, size-at-return, spawn timing, fecundity, etc.).
4. Competition for food or habitat between NOF and planted HOF.
5. Maintenance of within population substructure (e.g., multiple spawning aggregates).
6. Whether hatchery facilities (e.g., weirs, ladders, diversions) affect escapement back to the area of origin, rates of natural straying, or dispersement of fish (adults and juveniles) into under-used habitats, especially when adult returns are large.
7. Competition for prime spawning areas and redd superimposition.
8. Predation on juvenile NOF by planted HOF.
9. Spawning between HOF and NOF that reduces productivity.
10. HOF nutrient contribution to freshwater rearing areas.

Spatial structure is the range or distribution of NOF. Any viability evaluation must consider spatial structure within a population (or group of populations) because spatial structure affects extinction risk (McElhany et al. 2000). The effect of hatchery programs on salmon and steelhead spatial structure should be determined by:

1. Whether hatchery facilities (i.e., weirs, ladders, diversions, etc.) affect escapement back to the area of origin, rates of natural straying, or dispersal of fish (adults and juveniles) into under-used habitats, especially when adult returns are large.
2. Competition for prime spawning areas and redd superimposition.
3. Competition between planted HOF juveniles and NOF for rearing areas.
4. Predation on juvenile NOF by planted HOF.
5. Spawning between HOF and NOF that reduces productivity and affects spatial distribution.

Diversity refers to the distribution of traits within and among populations of salmon and steelhead. These traits include anadromy, morphology, fecundity, run timing, spawn timing, juvenile behavior, age at smolting, age at maturity, egg size, developmental rate, ocean distribution patterns, physiology and molecular genetic characteristics. A combination of genetic

and environmental factors largely causes phenotypic diversity. Variation or diversity in these and other traits is important to viability because a) it allows fish to take advantage of a wider array of environments; b) it spreads the risk (e.g., different ocean distribution patterns mean not all fish are at risk from local or regional varying ocean conditions); and c) genetic diversity allows fish to adapt to changing environmental conditions. Habitat, harvest, and hatchery factors can all affect diversity. In the case of hatchery programs, gene flow strongly influences patterns of diversity within and among salmon and steelhead populations. The effect of hatchery programs on salmon and steelhead diversity should be determined by:

1. The similarity of HOF traits relative to NOF traits and the rate of gene flow of HOF into a natural population or spawning aggregate. Natural rates of gene flow have helped salmon and steelhead to persist and adapt to local conditions and the natural or background level between spawning aggregates, between populations, between Distinct Population Segments and between Evolutionarily Significant Units should be maintained.
2. The extent to which a hatchery program preserves or builds salmon or steelhead genetic resources.

2. Effects Assessments

There are three categories of effects included in this report: (1) significant factors limiting population viability, (2) slowing trends toward extinction, and (3) improved viability (this corresponds to reducing the long-term risk of extinction or reducing survival gaps). A summary of effects assessments for Interior Columbia hatchery programs is provided in Table 1. A summary of progress in hatchery reform affecting seven groups of Interior Columbia Basin salmon and steelhead is provided in Table 2.

ESU-scale limiting factors analysis is derived primarily from ESA listing determinations and NOAA's 2005 report to Congress (NMFS 2005a). Limiting factors analysis at the population scale (see Attachment 1) is derived from salmon and steelhead recovery plans authored by state and local interests and by information provided by the ICTRT.

Slowing trends toward extinction includes hatchery supplementation programs that preserve genetic resources and increase the number of natural spawners. These programs buy time until the factors limiting viability are addressed. Actions in this category should be considered interim or short-term and, for this reason, risk associated with the origin and influence of naturally spawning hatchery-origin fish should not apply here.

Reductions in hatchery program impacts and, second, actions that benefit viability criteria fall into category three. For example, limiting exogenous hatchery-origin and natural-origin fish natural spawning and reestablishing self-sustaining populations in their former range using hatchery-origin fish would qualify for credit under category three.

The relative value or level of credit attributable to a hatchery action depends on (1) the hatchery practices, (2) the degree to which the hatchery program limits viability, (3) the population's importance to ESU or DPS viability, and (4) the status of the population. Hatchery programs for

example that isolate themselves from natural populations or spawning aggregates have little or no value to the biological status of salmon and steelhead.

Table 1. An assessment of hatchery programs in the Interior Columbia Basin.

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Authority for the Hatchery Program	Hatchery Program	Affected Population	Hatchery Program Assessment		
				A Top 5 limiting factor affecting population viability[1]	Slows trends toward extinction[2]	Improves viability and population status[3]
Upper Columbia Spring Chin ESU	Federal mitigation for Grande Coulee Dam	Leavenworth fishery mitigation	Wenatchee R.	No	No	No
		Entiat fishery mitigation	Entiat R.	Yes	No	No
		Winthrop supplementation & fishery mitigation	Methow R.	No	Yes	No
		Winthrop fishery mitigation	Okanogan R.	No	No	No
	PUD mitigation for Rock Island Dam	Chiwawa supplementation & fishery mitigation	Wenatchee R.	No	Yes	Pending progress on limiting factors
		White supplementation	Wenatchee R.	No	Yes	Yes
	PUD mitigation for Wells Dam	Methow supplementation & fishery mitigation	Methow R.	No	Yes	No
		Twisp supplementation & fishery mitigation	Methow R.	No	Yes	Pending progress on limiting factors
Upper Columbia steelhead	PUD mitigation for Rock Island Dam	Wenatchee supplementation mitigation	Wenatchee R.	No	Yes	Pending progress on limiting factors
	PUD mitigation for Wells Dam	Wells Dam supplementation & fishery mitigation	Methow R.	Yes	No	No
		Wells Dam supp. & fishery mitigation	Okanogan R.	Yes	No	No

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Authority for the Hatchery Program	Hatchery Program	Affected Population	Hatchery Program Assessment		
				A Top 5 limiting factor affecting population viability[1]	Slows trends toward extinction[2]	Improves viability and population status[3]
Upper Columbia steelhead	Federal mitigation for Grande Coulee Dam	Winthrop NFH supplementation & fishery mitigation	Methow R.	Yes	No	No
		Winthrop NFH supplementation & fishery mitigation	Okanogan R.	No	Yes	Pending progress on limiting factors
Snake R. spring/summer Chinook	Federal mitigation for Lwr Snake Dams	Tucannon supplementation & fishery mitigation	Tucannon R.	No	Yes	Pending progress on limiting factors
		Lostine supplementation mitigation (captive brood phase)	Lostine R.	No	Yes	Pending progress on limiting factors
		Catherine Crk supplementation mitigation (captive brood phase)	Catherine Crk	No	Yes	Yes
		Upper Grande Ronde supplementation mitigation (captive brood phase)	Upper Grande Ronde	No	Yes	Yes
		Imnaha supplementation & fishery mitigation	Imnaha R.	No	Yes	No
		Imnaha supplementation & fishery mitigation	Big Sheep & Lick Crks	No	Yes	No
		Lookingglass supplementation & fishery mitigation	Lookingglass Crk	No	Yes	Yes
		McCall fishery mitigation	SF Salmon	No	Yes	No
		Sawtooth fishery	Upper Salmon	No	Yes	No

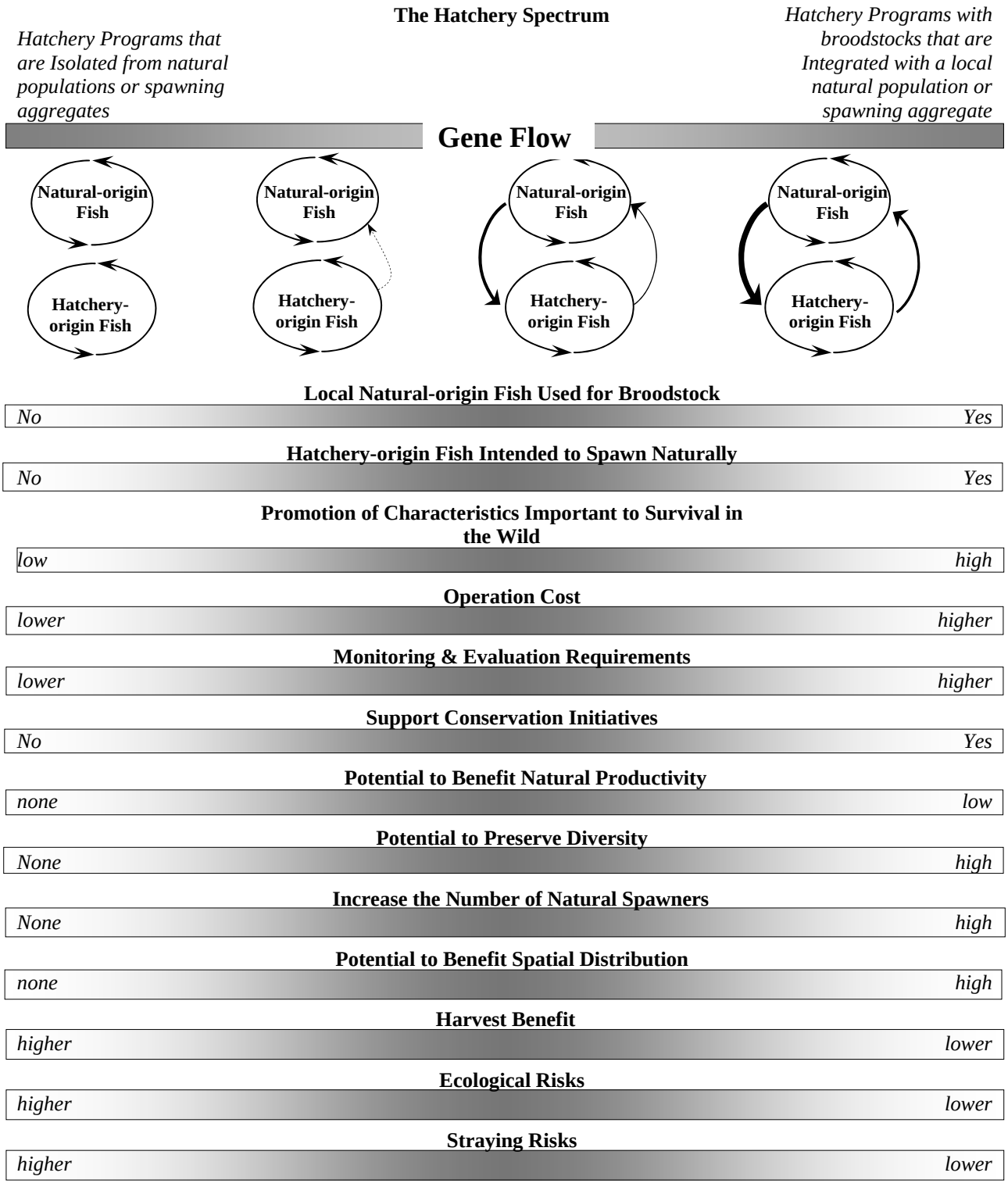
Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Authority for the Hatchery Program	Hatchery Program	Affected Population	Hatchery Program Assessment		
				A Top 5 limiting factor affecting population viability[1]	Slows trends toward extinction[2]	Improves viability and population status[3]
		mitigation				
Snake R spring/summer Chinook	Northwest Power Act	Tucannon supplementation mitigation (captive brood phase)	Tucannon R.	No	Yes	Yes
		Johnson Cr supplementation mitigation	SF Salmon	No	Yes	Pending progress on limiting factors
Snake R spring/summer Chinook (cont.)	Northwest Power Act (cont.)	Lemhi supplementation mitigation (captive brood phase)	Lemhi R.	No	Yes	Yes
		East Fork Salmon supplementation mitigation (captive brood phase)	East Fork Salmon	No	Yes	Yes
		West Fork Yankee Fork supplementation mitigation (captive brood phase)	Yankee Fork	No	Yes	No, program closed
	Idaho Power Company mitigation for Snake R Dams	Rapid River fishery mitigation	Little Salmon	No	No (preserves genetic resources from another ESU)	No
		Pahsimeroi, fishery mitigation	Pahsimeroi R	No	Yes	No
Snake R. steelhead	Federal mitigation for Lower Snake R. Dams	Tucannon, fishery mitigation	Tucannon R.	Yes	No	No
		Tucannon, supplementation & fishery mitigation	Tucannon R.	No	Yes	Pending progress on limiting factors
		Clearwater supplementatio	SF Clearwater	Unknown	Unknown	No

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Authority for the Hatchery Program	Hatchery Program	Affected Population	Hatchery Program Assessment		
				A Top 5 limiting factor affecting population viability[1]	Slows trends toward extinction[2]	Improves viability and population status[3]
		n & fishery mitigation				
		Dworshak Lolo Crk supplementation & fishery mitigation	Lolo Crk	Unknown	Unknown	No
		Little Salmon fishery mitigation	Little Salmon & Rapid R	Unknown	No	No
		East Fork Salmon supplementation mitigation	East Fork Salmon R	No	Yes	Pending progress on limiting factors
		East Fork Salmon fishery mitigation	East Fork Salmon R	No	No	No
Snake R steelhead (cont.)	Federal mitigation for Lower Snake R. Dams (cont.)	Sawtooth fishery mitigation	Upper Salmon R	Unknown	No	No
		Wallowa fishery mitigation	Wallowa, Minam, Lostine, Deschutes & John Day	Yes	No	No
		Cottonwood Pond fishery mitigation	Lwr Grande Ronde	Unknown	No	No
		Little Sheep supplementation & fishery mitigation	Imnaha	No	Yes	Pending progress on limiting factors & improved hatchery practices
	Federal mitigation for Dworshak Dam	Dworshak supplementation & fishery mitigation	SF Clearwater	Unknown	Unknown	No
		Dworshak fishery mitigation	NF Clearwater	No	Yes (only NF Clearwater fish left)	Pending progress on factors limiting NF Clearwater recovery
	Idaho Power Company	Pahsimeroi fishery	Pahsimeroi R	No	No	No

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Authority for the Hatchery Program	Hatchery Program	Affected Population	Hatchery Program Assessment		
				A Top 5 limiting factor affecting population viability[1]	Slows trends toward extinction[2]	Improves viability and population status[3]
	mitigation for Snake R Dams	mitigation				
		Oxbow fishery mitigation	Hells Canyon tributaries	No	Yes (only for fish originating above Hells Canyon Dams	No
Snake R fall Chinook	Federal mitigation for Lower Snake R. Dams	Lyons Ferry supplementation & fishery mitigation (includes Pittsburg Landing, Cpt John Rapids and Big Canyon acclimation sites)	Lower Mainstem Snake	No	Yes	Unknown
	Northwest Power Act	Nez Perce Tribal supplementation & fishery mitigation	Clearwater	No	Yes	Yes
Snake R fall Chinook (cont.)	Idaho Power Company mitigation for Snake R Dams	Oxbow fishery mitigation	Mainstem Snake	No	Yes	Unknown
Snake R sockeye	Northwest Power Act	Stanley Basin supplementation mitigation	Redfish, Alturas & Petit Lakes	No	Yes	Yes

[1] PCSRF 2005, UCSRB 2007
[2] Can slow trends toward extinction or prevent extinction of salmon and steelhead populations in the short-term.
[3] Can improve the viability and status of salmon and steelhead populations.

Figure 1. General hatchery program performance associated with gene-flow between natural-origin and hatchery-origin fish.



This report describes how hatchery programs can affect the abundance, productivity, spatial structure and diversity of natural-origin fish and summarizes the effects of individual interior Columbia hatchery programs on salmon and steelhead viability. Effects are reported as a benefit (+), threat (-), unknown, or no effect; and are based, first, on available information from research, monitoring, and evaluation at the hatchery program (e.g., estimates of hatchery and natural fish productivity and comparisons of hatchery-origin and natural-origin fish population dynamics); and second, on a comparison of hatchery practices at the program relative to guidelines described in Figures 2, 3, and 4. Differences between effects (e.g., weighing the effects of domestication against straying) and different levels of effect within and between categories are not quantified in this report.

Salmon and steelhead viability is the focus of this report and it is accepted here that hatchery programs can benefit or harm viability. Hatchery programs are designated as a benefit or + when:

a. Available information indicates that salmon or steelhead are at greater risk without artificial propagation intervening and that a specific hatchery program has been called upon to promote salmon or steelhead conservation. In general, when natural productivity is low and fish are not sustaining themselves (i.e., average natural-origin fish replacement rates are less than one), hatchery programs potentially can reduce short-term risk of extinction (i.e., buy time until natural productivity is sufficiently improved). When natural productivity is limited by the number of natural spawners, hatchery programs can supplement or reintroduce natural spawning to help a population or spawning aggregate become self-sustaining. These programs strictly follow practices designed to preserve or benefit viability (see Table 2). If the risk to a population or spawning aggregate dictates, hatchery practices may change accordingly. For example, temporarily increasing the proportion of hatchery-origin fish in the hatchery broodstock and the proportion of natural spawners comprised of hatchery-origin fish may be appropriate under particular circumstances to reduce risk. Hatchery practices, including contingencies dictated by different circumstances, must be documented in a Hatchery Genetic Management Plan for the program. A framework for identifying beneficial hatchery actions that potentially reduce spatial structure and genetic diversity risk and abundance and productivity risk is described in Figure 5.

b. A hatchery program serves a research function and does not jeopardize any natural population or major spawning aggregate of salmon or steelhead.

c. There are indications that natural-origin fish abundance, productivity, spatial distribution or genetic diversity has benefited from a hatchery program.

Hatchery programs are designated as a – or threat to population or spawning aggregate viability when:

a. Natural spawners are comprised, on average, of more than 5% hatchery-origin fish from an Isolated Hatchery Program. Isolated Hatchery Programs generally cannot have a + or beneficial effect on population viability because of the hatchery practices they follow (i.e., unless they are the only remaining genetic resources of an otherwise extirpated distinct group of fish).

b. The longer that the hatchery environment drives adaptation of hatchery-origin fish intended to spawn naturally. The proportion of natural-origin fish in the hatchery broodstock must exceed the proportion of hatchery-origin fish on the spawning grounds for the natural environment to drive adaptation. This proportion should exceed 0.7 for populations or spawning aggregates of moderate or high biological significance or if the goal is to maintain or improve their viability (HSRG 2004),

c. Hatchery-origin fish are intended to spawn naturally and when natural-origin fish annually comprise less than 10% of the hatchery broodstock (McElhany et al. 2000 and HSRG 2004),

d. Hatchery-origin fish intended to spawn naturally have different population dynamics (e.g., age structure) than the natural population or spawning aggregate they are intended to benefit,

e. Hatchery-origin fish prey on or compete with natural-origin fish for food and habitat,

f. Hatchery facilities change adult or juvenile spatial distribution,

g. Hatchery water diversions kill or injure juvenile or adult fish, and

h. There are indications that natural-origin fish abundance, productivity, spatial distribution or diversity has been depressed by a hatchery programs.

3. Reducing Incidental Hatchery Impacts on Salmon and Steelhead Viability

Hatchery programs have incidental or collateral impacts on salmon and steelhead in the course of performing their job and there are several key considerations in determining the significance of impacts and the appropriate level of response.

Human caused impacts to freshwater habitat mean river systems can produce fewer fish. When this happens and the productive potential of a river system is reduced or eliminated, hatchery propagation has frequently been called upon to at least preserve treaty and public fishing opportunities. Between 80 and 90 percent of the hatchery programs in the Interior Columbia serve these purposes under public laws (e.g., the Water Resources Development Act of 1986 (P.L. 99-662) authorizing the Lower Snake River Fish and Wildlife Compensation Plan), license

agreements and other mitigation commitments. Incidental to fulfilling these obligations, hatchery programs can harm salmon and steelhead viability. Considerations in determining what level of credit is appropriate for actions or reforms that reduce incidental impacts caused by hatchery programs include the following.

1. The biological significance and the management goal for a population or spawning aggregate (e.g., is the condition of a population or spawning aggregate particularly important to the viability of an ESU or DPS)?

2. The biological status of a population or spawning aggregate (e.g., is the group of fish in desperate need of help)?

3. The significance of the incidental impact (i.e., to what extent is the incidental impact a significant factor limiting viability). For example, if stray rates and natural spawning of hatchery fish are relatively low and genetic diversity is not a significant risk factor, then efforts to further reduce straying may not justify substantial credit.

4. A summary of progress in hatchery reform effecting seven distinct groups of Interior Columbia salmon and steelhead

Table 2. A summary of progress in hatchery reform effecting seven distinct groups of Interior Columbia Basin salmon and steelhead.

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Progress in Hatchery Reform
Snake River fall Chinook	Good reason to believe that the Snake River fall Chinook programs have increased spatial structure, genetic resources and probably abundance. Hatchery programs have helped jumpstart the ESU, and natural-origin fall Chinook returns have increased from <100 in 1990 to between 2,000 and 5,000 from 2001 through 2004. Spatial distribution has expanded into the Clearwater and lower Grande Ronde River sub-basins and changes at the Umatilla hatchery program has reduced straying from outside the basin and threats to fall Chinook diversity.
Snake River spring/summer Chinook	Grande Ronde Basin hatchery programs are using local fish for broodstock after terminating the use of Rapid River Chinook in the mid-1990s. Locally derived broodstock is being used in the Tucannon, Imnaha, S. Fork Salmon, Pahsimeroi, and upper Salmon Rivers.
Upper Columbia spring Chinook	The Winthrop National Fish Hatchery continues a transition (which began in 2001) to a locally derived broodstock (a combination of Methow River and Chewuch River Chinook) and is phasing out the use of Carson lineage stock.
Upper Columbia Steelhead	The use of broodstock derived from lower Columbia Skamania stock steelhead was terminated in the mid 1990s. A local broodstock was developed to replace Wells stock in the Wenatchee. The use of early spawned hatchery fish has been minimized, to promote more natural

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Progress in Hatchery Reform
	spawn timing of hatchery fish. Steelhead releases were terminated in the Entiat beginning in 1997. Wells Hatchery has increased the proportion of natural-origin steelhead in the annual broodstock, and has taken steps to synchronize the maturation of hatchery-origin steelhead with natural-origin steelhead in order to increase the reproductive success of hatchery fish spawning in the wild. The broodstock used in the propagation program in the Wenatchee basin is using primarily natural-origin fish collected from the Wenatchee River.
Middle Columbia Steelhead	The Umatilla program terminated the use of broodstock derived from lower Columbia Skamania stock steelhead beginning in 1981. The Walla Walla and Touchet programs have reduced the size of their juvenile releases by more than 25% to reduce straying. A local broodstock is being tested to replace Lyons Ferry stock in the Touchet River.
Snake River Steelhead	Hatchery releases in the lower Salmon River basin have been restricted to the Little Salmon River. Locally derived broodstock is being developed and tested for use in the Tucannon River and in the East Fork Salmon River. Use of hatchery-origin steelhead in tributary habitat has been reduced.

5. General guidance to help set expectations for hatchery programs and to understand potential benefits and risks to salmon and steelhead viability

Figure 2. A framework to help establish expectations for different kinds of hatchery programs.

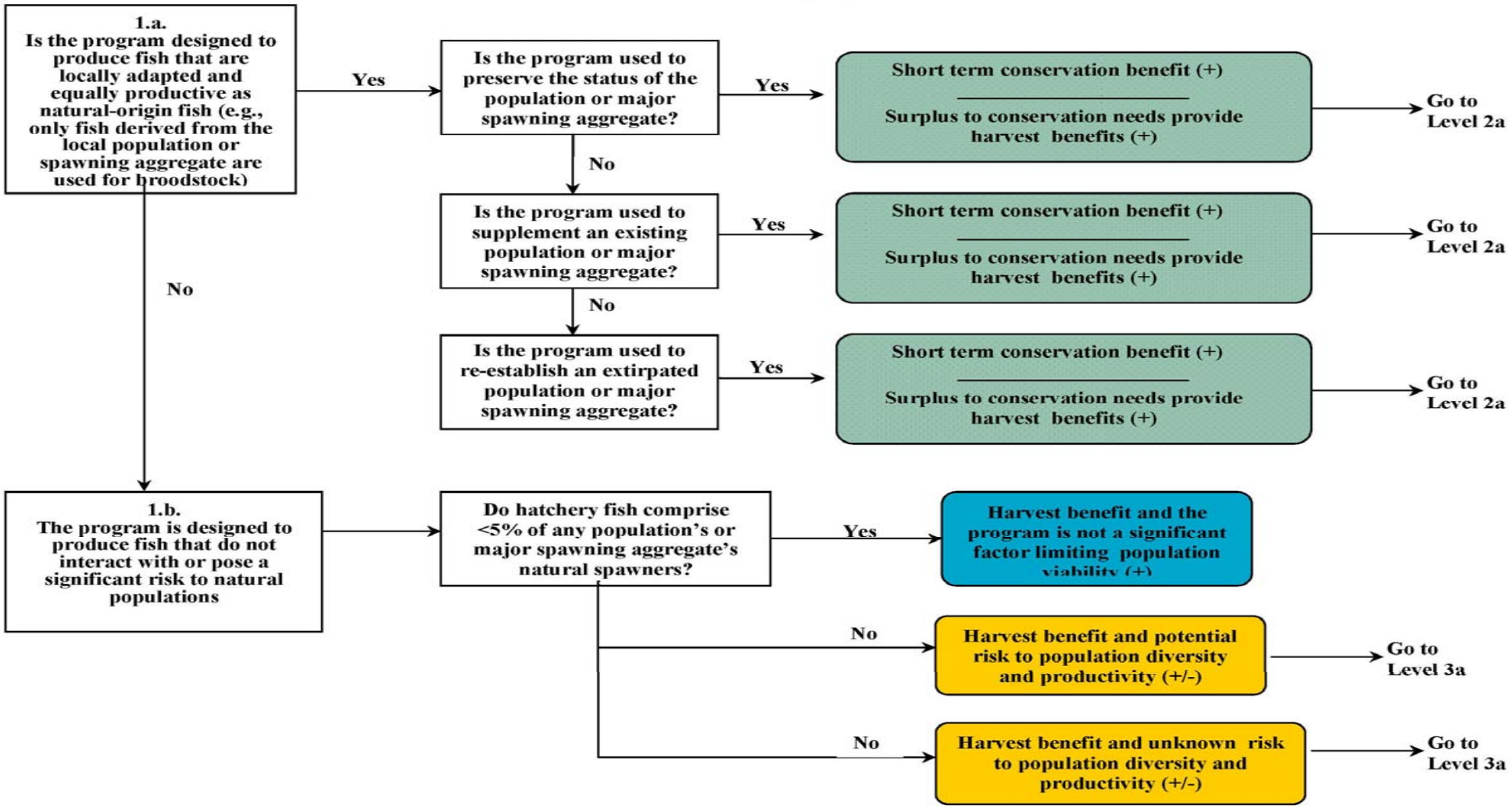
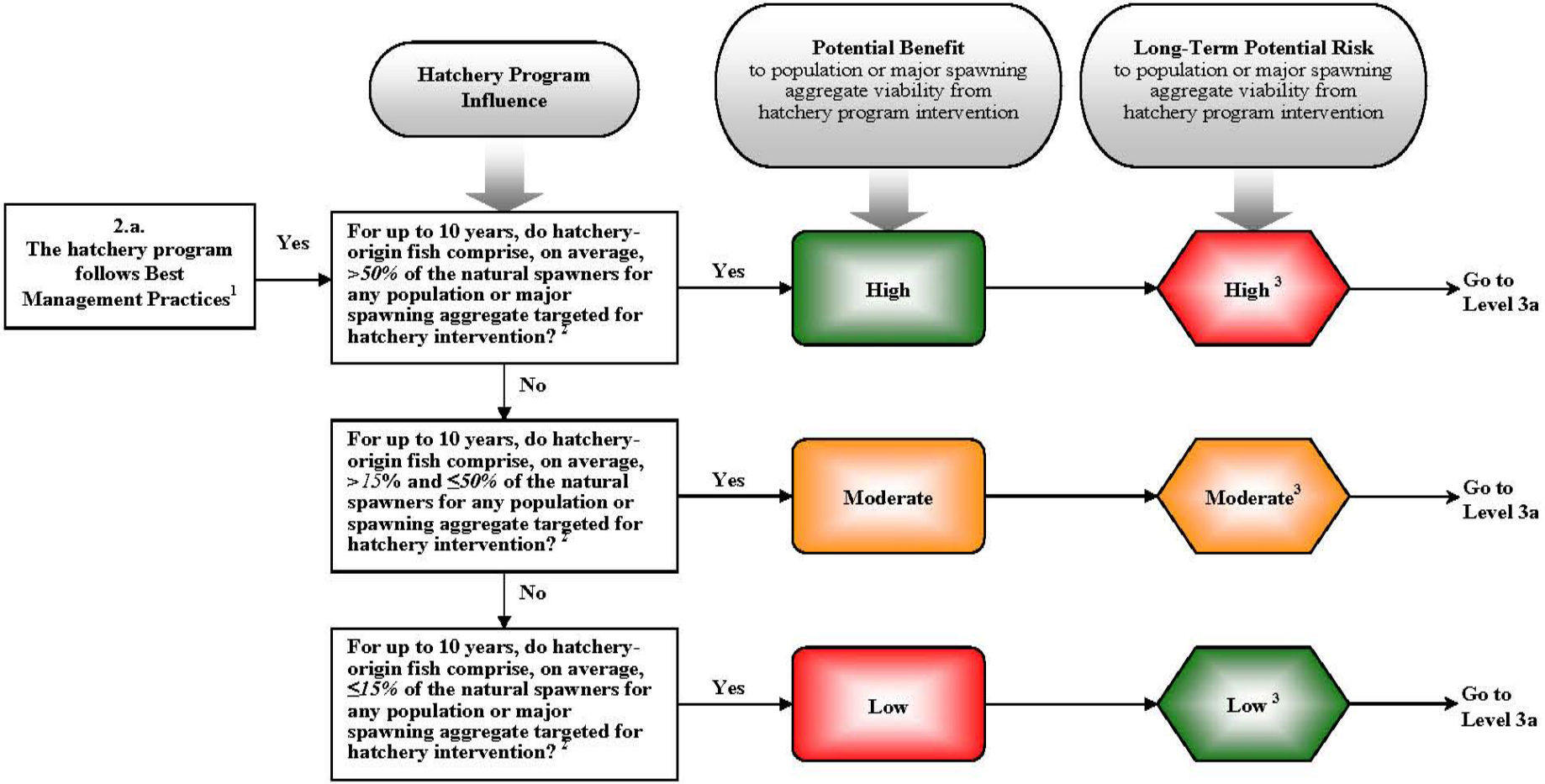


Figure 3. Framework to help evaluate the benefits and risks to salmon and steelhead viability from different levels of hatchery program intervention or influence.

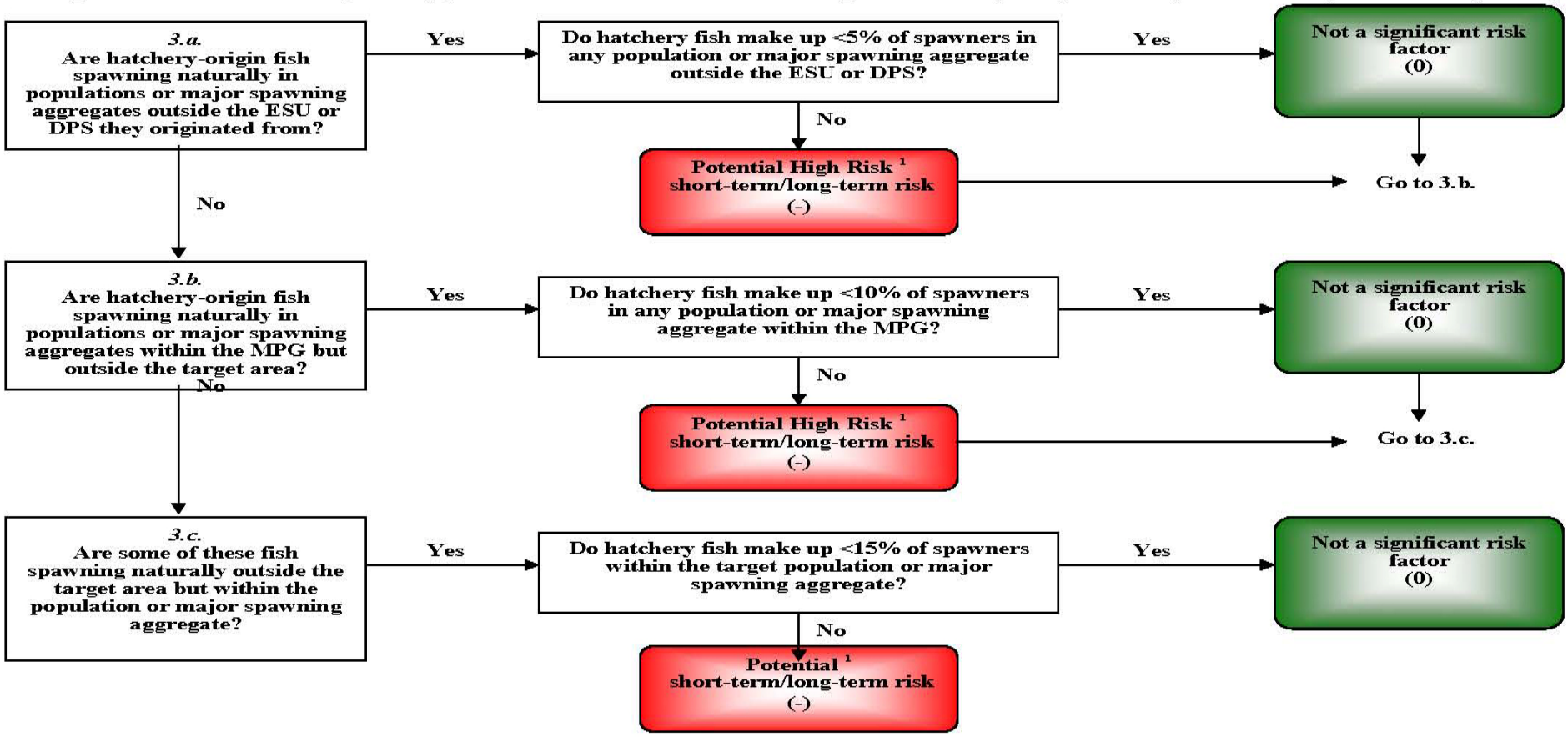


1 Hatchery programs that conform to the principles described in Flagg et al. (2004), Olson et al. (2004), and Mobrand et al. (2005) could be considered "best management practices" (see ICTRT 2007a).

[2] Note that hatchery fish fitness or productivity in nature, and risk criteria associated with the hatchery-origin fish composition of natural spawners, should be revisited as new information becomes available.

[3] Risk criteria associated with spawner composition (ICTRT 2005).

Figure 4. Framework to help identify potential risk to salmon and steelhead genetic diversity and productivity from hatchery fish that stray and spawn naturally.



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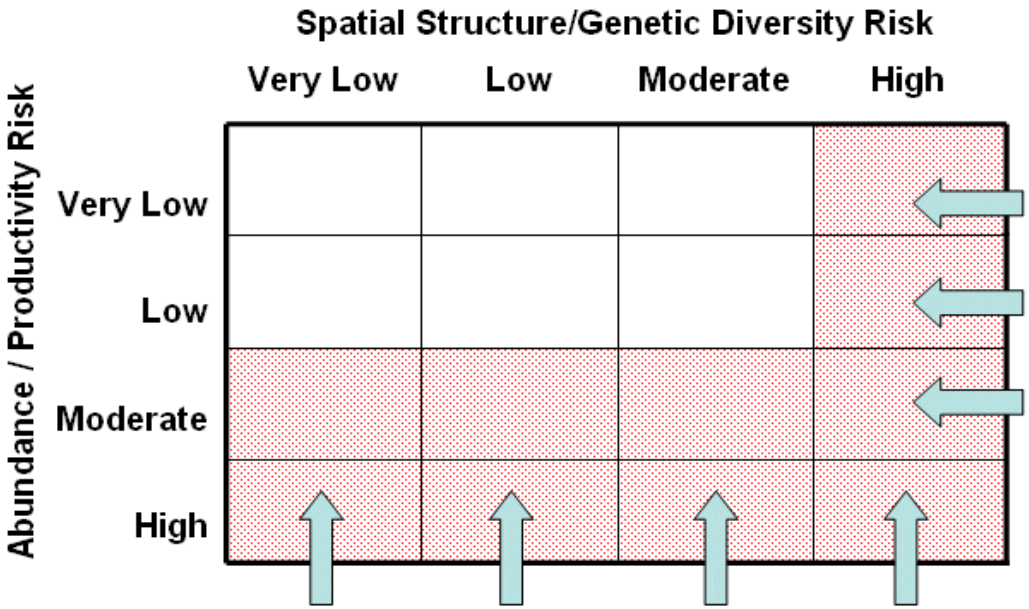
[2] Note that hatchery fish fitness or productivity in nature, and risk criteria associated with the hatchery-origin fish composition of natural spawners, should be revisited as new information becomes available.

[3] Risk criteria associated with spawner composition (ICTRT 2005).

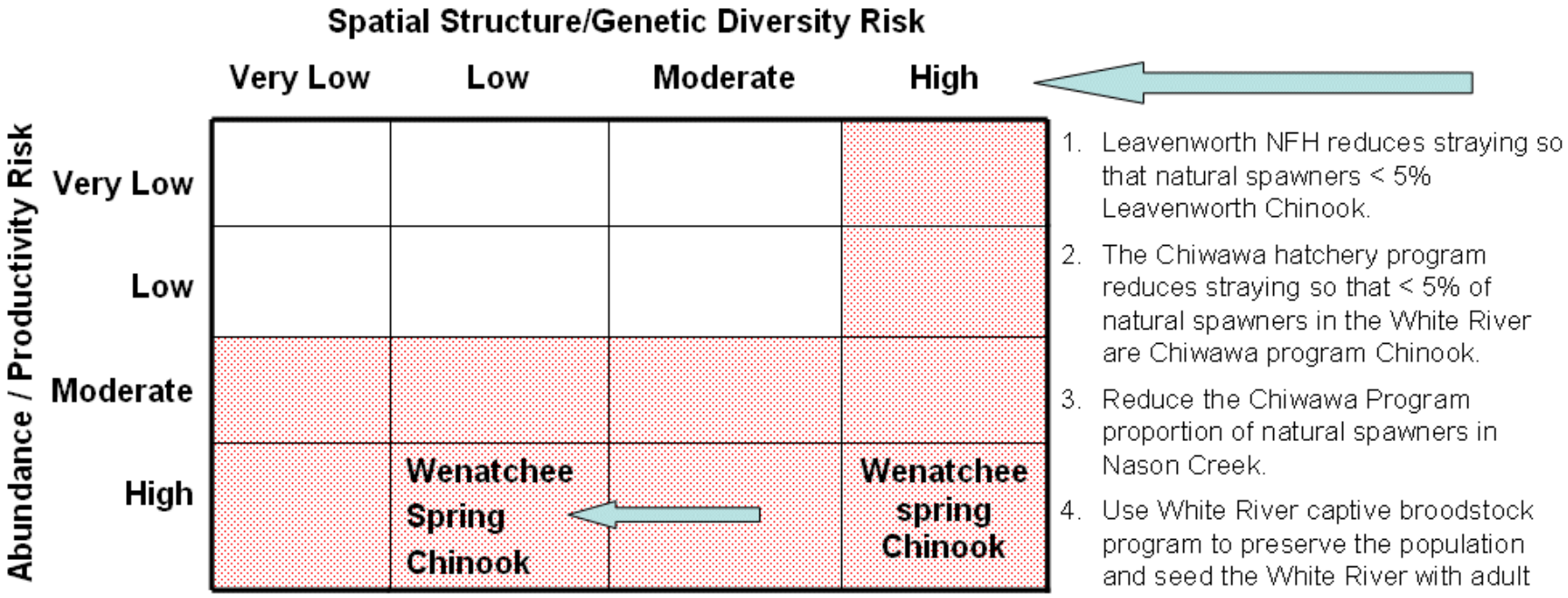
Figure 5. Hatchery actions that potentially can reduce salmon and steelhead population spatial structure and diversity risk and abundance and productivity risk.



1. When hatchery programs preserve a population until the factors limiting recovery are addressed.
2. Jump-start self-sustaining populations after the factors limiting population productivity are addressed.
3. Reduce the hatchery-origin fish (HOF) proportion of natural spawners as natural-origin fish (NOF) abundance and productivity increases.
4. Reduce the influence of any HOF that potentially depress NOF productivity (i.e., HOF that do not share the same population dynamics and fitness as NOF).
5. Improve juvenile and adult fish passage at hatchery facilities.

1. When hatchery programs preserve a population until the factors limiting recovery are addressed.
2. When offspring from naturally spawning HOF jump-start self-sustaining populations after the factors limiting population productivity are addressed.
3. Reduce the influence of any HOF that potentially depress NOF productivity (i.e., HOF that do not share the same population dynamics and fitness as NOF).
4. Reduce the number of NOF killed or injured by hatchery water diversions.
5. Freshwater nutrient levels increase due to HOF carcasses.
6. Reduce HOF predation on NOF through HOF size, release timing and release location measures.
7. Reduce competition with NOF for food and space through HOF size, release timing and release location measures.

Figure 6. Hatchery actions (numbers 1-4) that potentially can reduce Wenatchee spring Chinook salmon *spatial structure and diversity* risk from high to low when the level of genetic differentiation and variation between spawning aggregations increases (see Interior Columbia Technical Recovery Team risk rating system for spatial structure and genetic diversity). When factors limiting population productivity are addressed, hatchery action 5, 6, and 7 potentially can jumpstart naturally self-sustaining populations in the Chiwawa and White Rivers and reduce *abundance and productivity* risk.



Appendix D
Hatchery Effects Report

Attachment 1

An Inventory of Current Hatchery Programs in the Interior Columbia Basin and Their Effects on Salmon and Steelhead Viability

In the following table, Major Population Group and Population designations are based on information from the Lower Columbia/Willamette Technical Recovery Team (LCWTRT) and the Interior Columbia Technical Recovery Team (ICTRT). "Major Factors Currently Limiting Population Recovery" are derived from Recovery Plans submitted to NOAA Fisheries (*www.nwr.noaa.gov/salmon-recovery-planning/esa-recovery-plans/draft-plans.cfm*) and the NOAA Fisheries 2005 Report to Congress, Pacific Coastal Salmon Recovery Fund. An online version of this report is available at *www.nwr.noaa.gov/pcsrf/2005_PCSRF_Report.htm.* Individual hatchery program information and hatchery effects information are derived from Hatchery Genetic Management Plans (available from Federal, state and tribal hatchery program operators), from NOAA Fisheries Biological Opinions and from LCWTRT and ICTRT reports.

Also in the following table, Hatchery Effects on Population Viability uses the following Hatchery Influence Criteria developed by the ICTRT (2003).

Table 3. An Inventory of Current Hatchery Programs in the Interior Columbia Basin and Their Effects on Salmon and Steelhead Viability

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Lower Columbia River Chinook	Columbia Gorge spring Chinook strata	Big White Salmon R.	Extirpated Condit Dam blocked passage to production areas.	None	NA	**Extirpated Population**	Investigate using Klickitat Spring Chinook for reintroduction. Complete planning for remodel of Big White Salmon Ponds and weir to support reintroduction efforts after Condit removal in 2008. Reconstruction of Lyle Falls in Klickitat Master Plan provides proper collection facility for this activity (Yakama Nation). A weir also would control straying and the level of naturally spawning hatchery fish after a self-sustaining pop is reestablished (USFWS).

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Lower Columbia River Chinook (cont.)	Columbia Gorge spring Chinook strata (cont.)	Hood R	Extirpated	Hood R. Spring Chinook Reintroduction Program BPA funded. ESA authorization pending an updated HGMP and NEPA	1992	+ for jump-starting re-colonization of spr Chinook in the Hood R. - because broodstock from a different ESU (the nearby Deschutes) were used and because the majority of hatchery fish returns (between 1997 and 2001) derived from this broodstock were precocious males (60% mini jacks and 14% jacks) and stray rates averaged 18% between 1996-2002.	Full-term rearing capability would potentially increase fish survival and the programs potential contribution to recovery. Developing a broodstock from natural-origin fish returning to the Hood River is more likely to achieve successful reintroduction and benefit LCR Chinook ESU viability.
		Lwr Gorge fall Chinook (from upstream of the Washougal R. to Bonneville Dam)		Bonneville Upriver Bright Fall Chinook Program Isolated Fishery Program Corps of Engineers John Day Mitigation ESA authorization pending updated HGMP and NEPA	1977	- naturally spawning fish from Bonneville Hatchery (imports from outside the area) pose a risk to population diversity and productivity.	Consider terminating the release of Upriver Bright Chinook below Bonneville to reduce straying risks to endemic Chinook diversity and productivity. Consider the Spring Crk Hatchery reprogramming proposal as a means to accomplish this and other objectives (USFWS).

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Lower Columbia River Chinook (cont.)	Columbia Gorge fall Chinook strata (cont.)	Upper Gorge fall Chinook (from Bonneville Dam to the Big White Salmon River)		Spring Crk National Fish Hatchery Isolated Fishery Program Mitchell Act and Corps of Engineers funded. ESA Section 7 consultation pending and NOAA EIS underway	1973	+ because these fish are the most representative of the historical Columbia Gorge tule population. Preserving genetic resources until inundated habitats are restored. - naturally spawning fish from Bonneville Hatchery, Little White Salmon National Fish Hatchery, and Klickitat Hatchery (all are imports) pose a risk to population diversity and productivity.	Should incorporate natural origin fish into the hatchery broodstock as they become available. The proposed Wahkiacus acclimation facility on the Klickitat will allow for the collection of returning fall Chinook and potentially reduce the impact of these fish on Gorge fall Chinook diversity and productivity (Yakama Nation).
				Little White Salmon National Fish Hatchery Upriver Bright Isolated Fishery Program Mitchell Act Funded ESA Section 7 consultation pending and NOAA EIS underway	1983	- because naturally spawning fish from the Little White Salmon program are imports and pose a risk to population diversity and productivity.	Change the operation of the hatchery ladder (i.e., keep it open longer) and conduct terminal fisheries to put these fish to their intended use and reduce the number that spawn naturally (USFWS).

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Lower Columbia River Chinook (cont.)	Columbia Gorge fall Chinook strata (cont.)	Big White Salmon R.		Spring Crk National Fish Hatchery Isolated Fishery Program Mitchell Act and Corps of Engineers funded. ESA Section 7 consultation pending and NOAA EIS underway.	1973	+ because these fish are representative of the historical Columbia Gorge tule population, and for preserving genetic resources until inundated habitats are restored. - because naturally spawning fish from Little White Salmon National Fish Hatchery and Klickitat Hatchery (both are imports) pose a risk to population diversity and productivity.	Should incorporate natural origin fish into the hatchery broodstock as they become available. Complete planning for remodel of Big White Salmon Ponds and weir to support reintroduction efforts after Condit removal in 2008. The proposed Wahkiacus acclimation facility on the Klickitat will allow for the collection of returning fall Chinook and potentially reduce the impact of these fish on Gorge fall Chinook diversity and productivity (Yakama Nation). A weir also would control straying and the level of naturally spawning hatchery fish after a self-sustaining pop is reestablished (USFWS).

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Lower Columbia River Steelhead	Columbia Gorge Winter Steelhead Strata	Lower Columbia Gorge Tributaries (from upstream of the Washougal R to Bonneville Dam)		None	NA	**Unknown**	
		Upper Columbia Gorge Tributaries (from Bonneville Dam upstream to below the Big White Salmon R.)		None	NA	**Unknown**	
		Hood R. winter steelhead		Hood R winter steelhead Program BPA funded ESA authorization pending an updated HGMP and NEPA	1991	+ for increasing the number of natural spawners and preserving genetic resources. Research here is providing important hatchery steelhead productivity information.	
		Wind R. summer steelhead		None	NA	**Unknown**	

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Lower Columbia River Steelhead (cont.)	Columbia Gorge Summer Steelhead Strata	Hood R. summer steelhead		Hood R. summer steelhead Program BPA funded. ESA authorization pending an updated HGMP and NEPA	1998	+ for increasing the number of natural spawners and preserving genetic resources. Research here is providing important hatchery steelhead productivity information.	
		Hood R. summer steelhead (cont.)		Hood R summer steelhead Isolated Fishery Program Oregon Dept of Fish and Wildlife funded. ESA Section 10 permit pending an updated HGMP and NEPA	1987	**No Effect** Hatchery returns are prevented from escaping into Hood R summer and winter steelhead spawning areas. This program uses imported Skamania steelhead and will terminate prior to the removal of Powerdale Dam. Are concerns over straying and potential effects on diversity.	

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Lower Columbia River Coho	Columbia Gorge strata	Lower Gorge (upstream of the Washougal R to Bonneville Dam)		Bonneville Isolated Fishery Program Mitchell Act and Corps of Engineers funded. ESA authorization pending an updated HGMP and NOAA EIS that is underway	1938	- because these hatchery fish are highly domesticated. High stray rates (hatchery fish comprise 70-80% of the natural spawners) pose a risk to population productivity and diversity.	
		Hood R. (includes all OR tributaries upstream from Bonneville Dam to the Hood R.)		None	NA	- because hatchery strays from Bonneville and Klickitat hatchery programs comprise a high proportion of natural spawners and pose a risk to population productivity and diversity. Annual plants of coho from the Little White Salmon program were terminated in 2004.	The proposed Wahkiacus acclimation facility on the Klickitat will improve homing fidelity to the Klickitat River (Yakama Nation).

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Lower Columbia River Coho (cont.)	Columbia Gorge strata (cont.)	Big White Salmon (includes all WA tributaries upstream from Bonneville Dam to Big White Salmon)		None (Program at Little White Salmon/Willard NFH was discontinued in 2004)	NA	- because hatchery strays from Bonneville and Klickitat hatchery programs comprise a high proportion of natural spawners and pose a risk to population productivity and diversity.	Complete planning for remodel of Big White Salmon Ponds and weir to support reintroduction efforts after Condit removal in 2008. The proposed Wahkiacus acclimation facility on the Klickitat will improve homing fidelity to the Klickitat River (Yakama Nation). A weir also would control straying and the level of naturally spawning hatchery fish after a self-sustaining pop is reestablished (USFWS).

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Columbia River Chum	Gorge strata (upstream of the Washougal R. to include tributaries to the Bonneville Pool)	Lower Columbia Gorge tributaries (from upstream of the Washougal R to Bonneville Dam)		Duncan Crk/Ives Isl. Program	2001	+ for reintroducing chum salmon into Duncan Crk and for preserving genetic resources.	
		Upper Columbia Gorge tributaries (tributaries upstream from Bonneville dam)		None	NA	**No Effect**	

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Middle Columbia River Steelhead	Cascades Eastern Slope	Fifteen Mile Winter run steelhead	Passage through the mainstem Columbia Hydro system and instream cover, stream temperature, stream flow and sedimentation conditions that limit spawning and rearing success.	None	NA	**No Effect**	
		East side Deschutes tributaries A run steelhead (from the confluence with the Columbia to Trout Crk)	Passage through the Federal Columbia River Power System and high stray rates from Snake River hatchery programs, and instream cover, stream temperature, stream flow, sedimentation and fish passage conditions that limit spawning and rearing success.	None	NA	**-** because high stray rates from Snake River hatchery programs potentially disrupt natural selection processes and pose a risk to population diversity and productivity. Warm Springs National Fish Hatchery removes some stray steelhead.	Research is needed here to better determine the extent to which stray hatchery fish actually spawn in the Deschutes. Operate weirs at the mouths of Bake Oven, Trout and Buck Hollow Creeks to remove stray hatchery steelhead. Sorting facilities at the Sherars Fall ladder to remove stray hatchery steelhead (ODFW, USFWS).

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Middle Columbia River Steelhead (cont.)	Cascade Eastern Slope (cont.)	Klickitat A-run steelhead	Passage through the Federal Columbia River Power System and instream cover, channel complexity, passage and sedimentation conditions that limit spawning and rearing success.	Klickitat summer steelhead Isolated Fishery Program Mitchell Act funded. ESA authorization pending an updated HGMP and NOAA EIS that is underway	1983	- because transplanted steelhead pose a threat to population diversity and productivity. The Klickitat program uses transplanted highly domesticated Skamania steelhead. From Narum et al. 2006, less than 4% of natural-origin fish had their most likely assignment to naturally spawning hatchery fish. Klickitat steelhead genetic integrity has been maintained despite repeated hatchery introductions (Yakama Nation).	Klickitat Master Plan calls for phasing out the use of out-of- basin Skamania broodstock and converting to an endemic broodstock. The Klickitat program is to function to conduct one year versus two year smolt study.

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Middle Columbia River Steelhead (cont.)	Cascade Eastern Slope (cont.)	West-side Deschutes tributaries A-run steelhead (Trout Crk upstream to Pelton Dam)	Passage through the Federal Columbia River Power System passage, high stray rates from Snake River hatchery programs and instream cover, stream temperature, stream flow and channel complexity conditions that limit spawning and rearing success.	Round Butte summer steelhead Isolated fishery program Portland General Electric funded.	1974	**No Effect** Hatchery fish are uniquely marked and surveys indicate <5% spawn naturally. Natural fish excluded from broodstock since 1998. - for high stray rates from Snake River steelhead hatchery programs	Research is needed here to better determine the extent to which stray hatchery fish from Snake River programs are actually spawning in the Deschutes. Use genetic stock identification methods to collect wild Deschutes River steelhead for broodstock. Operate weir at mouth of Shitike Creek to remove stray hatchery steelhead. Sorting facilities at the Sherars Fall ladder to remove stray hatchery steelhead.
		Rock Creek A run steelhead	Channel morph, stream flow, habitat complexity, water quality, sedimentation and fish passage conditions that limit spawning and rearing success.	None	NA	**Unknown,** but straying, especially by non-indigenous hatchery steelhead is a concern	

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Middle Columbia River Steelhead (cont.)	Cascade Eastern Slope (cont.)	Big White Salmon summer/winter steelhead	Extirpated Condit Dam blocked access to production areas	White Salmon winter and summer steelhead Isolated Fishery Programs Mitchell Act funded ESA authorization pending an updated HGMP and NOAA EIS that is underway.	1986	**Extirpated Population** Steelhead pop was extirpated due to Condit Dam. Program uses non ESU Skamania steelhead. No information available regarding stray rates.	Based on biological considerations, identify a donor population to use for reintroduction purposes. Complete planning for remodel of Big White Salmon Ponds and weir to support reintroduction efforts after Condit Dam removal in 2008. A weir also would control straying and the level of naturally spawning hatchery fish after a self-sustaining pop is reestablished (USFWS).
	John Day	North Fork A run steelhead	Passage through the Federal Columbia River Power System, out-of-basin hatchery strays and stream temperature, stream flow, sedimentation and channel complexity conditions that limit spawning and rearing success.	None	NA	- for limited strays from outside the ESU and for an avg 6.7% stray rate (based on information from the mainstem John Day), primarily from Snake River hatchery programs poses a potential risk to pop diversity and productivity	Research is needed here to better determine the extent to which stray hatchery fish from outside programs are actually spawning in the John Day.,

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Middle Columbia River Steelhead (cont.)	John Day (cont.)	Middle Fork A run steelhead	Passage through the Federal Columbia River Power System, out-of-basin hatchery strays and stream temperature, stream flow and sedimentation conditions that limit spawning and rearing success.	None	NA	- for limited strays from outside the ESU and for an avg 6.7% stray rate (based on information from the mainstem John Day), primarily from Snake R hatchery programs poses a potential risk to pop diversity and productivity	Research is needed here to better determine the extent to which stray hatchery fish from outside programs are actually spawning in the John Day.
		Upper Mainstem A run steelhead	Passage through the Federal Columbia River Power System, out-of-basin hatchery strays, and stream temperature, stream flow, sedimentation, and channel complexity conditions that limit spawning and rearing success.	None	NA	- for limited strays from outside the ESU and for an avg 6.7% stray rate (based on information from the mainstem John Day), primarily from Snake R hatchery programs poses a potential risk to pop diversity and productivity	Research is needed here to better determine the extent to which stray hatchery fish from outside programs are actually spawning in the John Day.

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Middle Columbia River Steelhead (cont.)	John Day (cont.)	South Fork A run steelhead	Passage through the Federal Columbia River Power System, out-of-basin hatchery strays and instream cover, stream temperature, stream flow and sedimentation conditions that limit spawning and rearing success.	None	NA	- for limited strays from outside the ESU and for an avg 6.7% stray rate (based on information from the mainstem John Day), primarily from Snake R hatchery programs poses a potential risk to pop diversity and productivity	Research is needed here to better determine the extent to which stray hatchery fish from outside programs are actually spawning in the John Day.
		Lower Mainstem A-run steelhead	Passage through the Federal Columbia River Power System and out-of-basin hatchery strays and stream flow, stream temperature, sedimentation and instream cover conditions that limit spawning and rearing success.	None	NA	- for limited strays from outside the ESU and for an avg 6.7% stray rate (based on information from the mainstem John Day), primarily from Snake R hatchery programs poses a potential risk to pop diversity and productivity	Research is needed here to better determine the extent to which stray hatchery fish from outside programs are actually spawning in the John Day.

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Middle Columbia River Steelhead (cont.)	Umatilla / Walla Walla Rivers	Umatilla R. A-run steelhead	Passage through the Federal Columbia River Power System and stream flow, channel complexity, sedimentation and stream temperature conditions that limit spawning and rearing success.	Umatilla summer steelhead Program BPA/NWPPC funded. ESA pending an updated HGMP and NEPA	1981	+ Recovery program for preserving genetic resources and temporarily boosting the number of natural spawners. Natural origin fish abundance averaged more than 2,000 from 1999 thru 2004. Tech Recovery Team abundance threshold is 2250. - because out of basin hatchery strays (stray rates (avg. of 5.4% between1992-2003) pose a potential risk to pop diversity and productivity. Note that fish from this program stray into other basins and pose a threat to pop diversity and productivity.	An expanded monitoring program would better determine the extent of natural production and the extent to which stray hatchery fish from outside programs are actually spawning in the Umatilla River.

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Middle Columbia River Steelhead (cont.)	Umatilla / Walla Walla Rivers (cont.)	Walla Walla R. A run steelhead	Passage through the Federal Columbia River Power System and local sedimentation, stream flow, channel complexity and instream cover conditions, seasonal water temperatures and passage that limit spawning and rearing success.	Walla Walla summer steelhead Isolated Fishery program BPA/LSRCP funded ESA Section 7 consultation pending an updated HGMP	1983	**No Effect** Well isolated <5% of hatchery fish spawn naturally. Program uses steelhead from outside the ESU (partially derived from upper Columbia steelhead). Hatchery fish are planted low in the basin away from primary steelhead production areas. Hatchery program size (i.e., smolt releases) has been cut by >40%.	1. Construct acclimation pond and adult trapping facility in lwr Walla Walla (terminate direct stream releases). 2. Fund on station trapping and acclimation if the program is converted to an integrated program. 3. Fund continued M&E for hatchery effects on natural populations. 4. Fund PIT-tagging to M&E hatchery returns.
		Touchet A-run steelhead	Passage through the Federal Columbia River Power System, naturally spawning non-indigenous hatchery fish and channel complexity, sedimentation and stream flow conditions and seasonal water temperatures that limit spawning and rearing success.	Touchet summer steelhead Isolated Fishery Program BPA/LSRCP funded ESA Section 7 consultation pending an updated HGMP	1983	**-** because non-indigenous naturally spawning hatchery fish potentially pose a risk to population diversity and productivity. The program is not well isolated. Facilities are inadequate to manage hatchery fish escapement. Smolt releases reduced by 32% since 2001 to reduce impacts. Plans are to phase this program out if the integrated broodstock Touchet program is successful.	Adult trapping facilities being upgraded. Need to improve curtain over diversion dam to limit jumping, and to install resistance counter in new ladder. 1. natural spawner genetic assessment and 2. PIT-tag and M&E hatchery fish returns and distribution.

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Middle Columbia River Steelhead (cont.)	Umatilla / Walla Walla Rivers (cont.)	Touchet A run steelhead	Same	Touchet summer steelhead Integrated Broodstock Fishery Program BPA/LSRCP funded. ESA section 10 permit pending an updated HGMP and NEPA	2000	**-** because naturally spawning hatchery fish pose a potential risk to pop diversity and productivity.	Existing facilities are being upgraded which will reduce risk to pop productivity and diversity. Need to improve curtain over diversion dam to limit jumping, and to install resistance counter in new ladder. 1. natural spawner genetic assessment and 2. PIT-tag and M&E hatchery fish returns and distribution.
		Willow Creek A run steelhead	Extirpated	None	NA	**Extirpated Population**	
	Yakima	Naches R. A run steelhead	Passage through the Federal Columbia River Power System and fish passage, stream flow, channel complexity and water quality conditions that limit spawning and rearing success.	None	NA	**No Effect** No hatchery releases into the Yakima Basin since 1992	Continue to support Kelt Reconditioning program

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Middle Columbia River Steelhead (cont.)	Yakima (cont.)	Satus Crk A-run steelhead	Passage through the Federal Columbia River Power System and instream cover, channel complexity and stream temperature conditions that limit spawning and rearing success.	None	NA	**No Effect** No hatchery releases into the Yakima Basin since 1992	Continue to support Kelt Reconditioning program
		Toppenish A-run steelhead	Passage through the Federal Columbia River Power System and channel complexity, stream flow, instream cover and water quality conditions that limit spawning and rearing success.	None	NA	**No Effect** No hatchery releases into the Yakima Basin since 1992	Continue to support Kelt Reconditioning program
		Upper Yakima A-run steelhead	Passage through the Federal Columbia River Power System and fish passage, instream cover, stream flow, channel complexity and water quality conditions that limit spawning and rearing success.	None	NA	**No Effect** No hatchery releases into the Yakima Basin since 1992	Continue to support Kelt Reconditioning program

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Middle Columbia River Steelhead (cont.)	Yakima (cont.)		Same as above	Kelt (i.e., surviving spawners) reconditioning program BPA funded ESA Section 10 permit pending an updated HGMP and NEPA	2000	+ Recovery program potentially can increase pop abundance and productivity. Post spawning natural fish are collected in lower Yakima basin, reconditioned, and released to return to their area of origin and spawn a second time.	Continue to support Kelt Reconditioning program

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Snake R. Spr/ Summer Chinook	Lower Snake	Tucannon R.		Tucannon Captive Broodstock program Funded by BPA ESA Section 10 permit pending an updated HGMP and NEPA	1997	+ for preserving and building genetic resources after severe population declines during the mid 1990s. 2006 is the last year that captive broodstock adults will be used for hatchery broodstock. Note: The Umatilla and Walla Walla Chinook programs are not included in this ESU and are not included in this table. Strays from the Umatilla program can exceed 5% of the natural spawners in the Tucannon and pose a risk to productivity and genetic diversity. There is a question about but no data to determine Walla Walla program Chinook natural spawning in the Tucannon.	Apply unique external mark on Umatilla Hatchery spring Chinook to facilitate their removal from the Tucannon and protect diversity. Reduce Umatilla Hatchery spring Chinook program to reduce straying. About 70% of the fish make it to the existing weir on the Tucannon. Provide a new adult weir lower in the Tucannon River to remove strays. WDFW opposes a new weir based on concerns over the potential to disrupt spatial distribution in the Tucannon. Fund genetic analysis of existing samples. Increase mark rate for the Walla Walla spring Chinook program or cap the program at 250k (WDFW). Little Opportunity here to significantly benefit Tucannon Chinook viability.

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Snake R. Spr/ Summer Chinook (cont.)	Lower Snake (cont.)	Tucannon R.		Tucannon Program BPA/LSRCP funded ESA Section 10 permit pending an updated HGMP and NEPA	1985	+ Recovery program uses Tucannon broodstock to supplement or boost the number of natural spawners until factors limiting survival are addressed. - for the Umatilla Chinook program because strays can approximate 5% of the natural spawners in the Tucannon.	See above. 1. natural spawner genetic assessment, 2. PIT-tag and M&E hatchery fish returns and distribution, and 3. construct new trap in the lower Tucannon to remove stray hatchery fish (USFWS).
		Asotin Crk.		None	NA	**No Effect**	Re-introduction using Tucannon stock is possible in the future if mainstem survival improves, in-basin habitat is restored and surplus Tucannon fish are available to use as donors. Asotin Creek has limited Chinook production potential but is very important for steelhead.

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Snake R. Spr/ Summer Chinook (cont.)	Grande Ronde/Imnaha	Wenaha R.	Passage through the Federal Columbia River Power System. Spawning and rearing areas are in Wilderness system but water temperatures are a factor limiting fish passage and rearing in the Lower Grande Ronde.	None	NA	**No Effect** Straying from Lookingglass Hatchery Rapid River stock has been eliminated and no longer poses a threat to this population. Approximately 5% of the naturally spawning fish are strays from the Lostine, Catherine Crk and Upper Grande Ronde programs (ODFW).	Continue monitoring spawning escapement. Didson Acoustic Imaging wier recommended by NEOH M&E plan.
		Lostine/Wallowa Rivers		Lostine Captive Broodstock Program BPA funded. ESA Section 10 permit pending an updated HGMP and NEPA	1997 First adult returns in 2002	+ because this temporary captive broodstock program is preserving and building genetic resources. Straying from Lookingglass Hatchery Rapid River stock has been eliminated and no longer poses a threat to this population. The program is shifting to conventional smolt program.	Outplant into vacant habitats including Bear Crk. Preserve stock structure and do not outplant into Hurricane and Wallowa crks (ODFW).

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Snake R. Spr/ Summer Chinook (cont.)	Grande Ronde/Imnaha (cont.)	Lostine/Wallowa Rivers (cont.)		Lostine Program BPA funds captive broodstock BPA/LSRCP funds conventional program ESA Section 10 permit pending an updated HGMP and NEPA	1999 First adult returns in 2001	+ Recovery Program preserves genetic resources and boosts the number of natural spawners until factors limiting survival are addressed.	Complete NEOH to improve current supplementation program. 1. natural spawner genetic assessment and 2. PIT-tag and M&E hatchery fish returns and distribution.
		Minam River	Passage through the Federal Columbia River Power System. Spawning and rearing areas are in productive Wilderness system.	None	NA	**No Effect** Straying from Lookingglass Hatchery Rapid River stock has been eliminated and no longer poses a threat to this population. Approximately 5% of the naturally spawning fish are strays from the Lostine, Catherine Crk and Upper Grande Ronde programs (ODFW).	Continue monitoring spawning escapement.

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Snake R. Spr/ Summer Chinook (cont.)	Grande Ronde/Imnaha (cont.)	Catherine Crk		Catherine Crk Captive Broodstock Program BPA/LSRCP funded. ESA Section 10 permit pending an updated HGMP and NEPA	1996	+ because this temporary captive broodstock program is preserving and building genetic resources.	None. Continue as planned. Use surplus eggs from this program as the preferred source for introduction into Lookingglass Creek.

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Snake R. Spr/ Summer Chinook (cont.)	Grande Ronde/Imnaha (cont.)	Catherine Crk		Catherine Crk Program BPA/LSRCP funded ESA Section 10 permit pending an updated HGMP and NEPA	2001	+ Recovery supplementation program following practices that promote viability in the wild.	Complete NEOH to improve existing supplementation program. Assure that adult weir and trap operates as designed. Manage adult returns based on sliding scale. Consideration should be given to eliminating this program to better balance hatchery/natural production Grande Ronde Basin wide (ODFW). Limit release of surplus hatchery adults to vacant or nearly vacant habitat adjacent to the Catherine Creek. 1. natural spawner genetic assessment and 2. PIT-tag and M&E hatchery fish returns and distribution.

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Snake R. Spr/ Summer Chinook (cont.)	Grande Ronde/Imnaha (cont.)	Grande Ronde Upper mainstem		Upper Grande Ronde Captive Broodstock Program BPA/LSRCP funded. ESA Section 10 permit pending an updated HGMP and NEPA	1996	+ Rescue program Temporary captive broodstock program to preserve and build genetic resources.	None. Continue as currently operated.
		Grande Ronde Upper mainstem (cont.)		Upper Grande Ronde Program BPA/LSRCP funded. ESA Section 10 permit pending an updated HGMP and NEPA	2001	+ Recovery supplementation program following practices that promote viability in the wild.	Complete NEOH to improve existing supplementation progam. Assure that adult weir and trap operates as designed. 1. natural spawner genetic assessment and 2. PIT-tag and M&E hatchery fish returns and distribution.

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Snake R. Spr/ Summer Chinook (cont.)	Grande Ronde/Imnaha (cont.)	Imnaha R.		Imnaha program BPA/LSRCP funded ESA Section 10 permit pending an updated HGMP and NEPA	1995	+ for successfully boosting the number of natural spawners. - for continued high hatchery influence that potentially disrupts natural selection. Since the program has successfully jumpstarted natural production, reducing the number of naturally spawning hatchery fish would reduce risk to pop diversity and productivity. Pop abundance at or above recovery threshold in 2001, 02 and 03. The proportion of naturally spawning HOF> proportion of NOF in the hatchery broodstock for 11 of 15 years between 1988 and 2003.	Complete NEOH (modify weir and acclimation ponds) to improve existing supplementation program. Modify weir to improve collection efficiency and manage the escapement and natural spawning of hatchery fish. Do not release hatchery adults above the weir after natural escapement exceeds recovery thresholds for one generation. Increase the proportion of natural fish in the hatchery broodstock so that it meets or exceeds the proportion of hatchery fish spawning naturally. 1. natural spawner genetic assessment and 2. PIT-tag and M&E hatchery fish returns and distribution.

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Snake R. Spr/ Summer Chinook (cont.)	Grande Ronde/Imnaha (cont.)	Big Sheep and Lick Crks		Associated with the Imnaha program described above	1995	+ for boosting the number of natural spawners. Surplus adults from the Imnaha program are planted into Big Sheep and Lick Crks. - the longer the program uses Imnaha broodstock that is thought to have different life-history characteristics than Big Sheep Chinook and limit population diversity.	In near term, continue release of surplus Imnaha Hatchery adults for reintroduction into Lick Creek. Cease the use of Imnaha fish for broodstock (ODFW). Longer term: once natural population established terminate releases of hatchery adults. 1. natural spawner genetic assessment and 2. PIT-tag and M&E hatchery fish returns and distribution.

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Snake R. Spr/ Summer Chinook (cont.)	Grande Ronde/Imnaha (cont.)	Lookingglass Crk	Previous hatchery practices that were a limiting factor have been discontinued.	Lookingglass Reintroduction Program BPA/LSRCP funded ESA Section 10 permit pending an updated HGMP and NEPA	2001	+ for re-introduction following extirpation. Historic hatchery practices blocked access and extirpated local population. Current reintroduction program is using nearest suitable stock (Catherine Creek).	Complete NEOH to improve the existing program. Continue reintroduction using surplus Catherine Crk captive broodstock. Phase out the use of Catherine Crk Chinook and use natural-origin Chinook returning to Lookingglass Crk for hatchery broodstock. Once in place, increase number of adults released above the hatchery for natural production (the hatchery rears several listed populations used for supplementation). Modify the hatchery intake and fish ladder to allow/reestablish fish passage and improve spatial distribution. 1. natural spawner genetic assessment and 2. PIT-tag and M&E hatchery fish returns and distribution.

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Snake R. Spr/ Summer Chinook (cont.)	SF Salmon (cont.)	Little Salmon R.	Limited Chinook salmon production potential.	Rapid River Isolated Fishery Program Idaho Power Company funded. ESA Section 10 permit pending an updated HGMP and NEPA	1964	- Hatchery fish are 100% marked and a hatchery weir prevents their escapement into Rapid River spawning areas. Escapement into the upper Little Salmon River drainage is not controlled. The Rapid River program preserves genetic resources indigenous to areas taken out of salmon and steelhead production by the Hells Canyon Dams. Surplus hatchery fish provide fishing opportunity.	Continue to manage Rapid River for natural production. Little Salmon River has limited natural production potential and is managed as state and tribal terminal fishing area. Conduct spawning ground surveys to determine Little Salmon Chinook production. Develop supplementation program for Rapid River summer Chinook

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Snake R. Spr/ Summer Chinook (cont.)	SF Salmon (cont.)	SF Salmon R.		McCall Isolated fishery program. 3rd phase of Idaho Supplementation Studies BPA/LSRCP funded ESA Section 7 consultation pending an updated HGMP	2004	**Unknown** Too early to determine if Recovery Supplementation has been successful or to determine effects of recent transition to an Isolated program. One way gene flow from hatchery to natural fish is likely until Idaho supplementation study is completed. McCall influence/straying in the Secesh is medium (10-25%) and is highest in large run-size years. Part of the Idaho Supplementation Study to be completed in 2012.	Conduct surveys to determine if hatchery fish spawning is limited to the area immediately below weir. Replace existing adult weir to manage the escapement of hatchery fish. Develop new broodstock management agreement, phase-out ISS Phase III and reinitiate supplementation (Nez Perce). Assess options for providing acclimation facilities as control measure for straying into Secesh River and East Fork South Fork. 1. natural spawner genetic assessment and 2. PIT-tag and M&E hatchery fish returns and distribution.

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Snake R. Spr/ Summer Chinook (cont.)	SF Salmon (cont.)	SF Salmon R.		Johnson Crk Integrated program BPA/LSRCP funded ESA 4(d) limit and NEPA in place	2000	+ because this program is designed to preserve summer Chinook salmon genetic resources until factors limiting recovery are addressed. Important supplementation experiment based on all-natural-origin local broodstock. Longer-term effects on productivity and diversity being evaluated.	None. Continue using temporary facilities until sufficient evaluation information becomes available to help inform proper management. Replace the existing weir to improve its effectiveness. Fund the genetic analysis of existing samples. Potential to increase production to 300K smolts Nez Perce).
		Secesh R.		None	NA	- from McCall Hatchery program influence/strays that pose a potential risk to Secesh population productivity and diversity.	See South Fork above. Continue to monitor spawning escapement.
		East Fork		McCall	2000	**Unknown** Opportunistic reintroduction effort using adult outplants.	None. Continue to monitor spawning escapement.

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Snake R. Spr/ Summer Chinook (cont.)	MF Salmon	Chamberlain Crk	Passage through the Federal Columbia River Power System. Spawning and rearing areas in productive Wilderness system.	None	NA	**No Effect** Important population in wilderness area. No hatchery influence	None. Continue to monitor spawning escapement.
		Lower MF Salmon R.	Same as above	None	NA	**No Effect**	None. Continue to monitor spawning escapement.
		Big Crk	Passage through the Federal Columbia River Power System. Small legacy mining impacts, otherwise spawning and rearing areas in wilderness system.	None	NA	**No Effect** Important population with a unique life history in this MPG (Summer Run). Wilderness area with no hatchery influence.	None. Continue to monitor spawning escapement.
		Camas Crk	Same as above	None	NA	**No Effect**	None. Continue to monitor spawning escapement. As a group, these are important populations for diversity and distribution of natural, upriver Chinook in wilderness streams
		Loon Crk		None	NA	**No Effect**	
		Upper Middle Fork Salmon R.		None	NA	**No Effect**	
		Sulphur Crk		None	NA	**No Effect**	None. Continue to monitor spawning escapement.

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Snake R. Spr/ Summer Chinook (cont.)	MF Salmon (cont.)	Bear Valley Crk	Same as above	None	NA	**No Effect** Important large, productive population that seeded extensive rearing areas downstream in main Middle Fork. Wilderness area with no hatchery influence	None. Continue to monitor spawning escapement.
		Marsh Crk	Same as above	None	NA	**No Effect**	None. Continue to monitor spawning escapement.
	Upper Salmon R.	North Fork Salmon R.		None	NA	**No Effect**	None. Continue to monitor spawning escapement.
		Lower Mainstem		None	NA	**Unknown** No associated hatchery program. This is a unique life history of summer Chinook, mainstem spawners and downstream from the spring Chinook program at Sawtooth Hatchery	None. Continue to monitor spawning escapement.

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Snake R. Spr/ Summer Chinook (cont.)	Upper Salmon R. (cont.)	Pahsimeroi R.		Pahsimeroi Isloated Fishery Program. 3rd phase of Idaho Supplementation Studies Idaho Power Company funded. ESA Section 10 permit pending an updated HGMP and NEPA	2004	**Unknown** Too early to determine effect of Recovery Supplementation or of recent transition to an Isolated program.	Continue to monitor spawning escapement. Develop broodstock management plan, discontinue ISS Phase III and reinitiate supplementation (Nez Perce).
		East Fork	Passage through the Federal Columbia River Power System. Headwaters are in protected wilderness.	East Fork Captive Rearing Experiment BPA funded. ESA Section 10 permit pending an updated HGMP and NEPA	1995	+ for investigating and improving knowledge of captive broodstock techniques. New genetic analysis is necessary to better establish population status.	Phase out as scheduled.

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Snake R. Spr/ Summer Chinook (cont.)	Upper Salmon R. (cont.)	Yankee Fork	Passage through the Federal Columbia River Power System and channel complexity and instream cover conditions limit spawning and rearing success.	West Fork Yankee Fork Captive Rearing Experiment BPA/LSRCP funded.	1997 In final evaluation stage. No longer releasing any fish.	+ for investigating captive rearing techniques	Phase out captive rearing as scheduled. Develop a new HGMP. Initiate a new supplementation program for the upper Yankee Fork upstream of the West Fork Yankee Fork. Initially use Sawtooth Hatchery Chinook for broodstock but in the longer term, develop in basin adult collection and juvenile acclimation facilities and transition to locally derived broodstock for supplementation program. Assess need to provide additional rearing facilities.
		Valley Crk		None	NA	**No Effect**	None. Continue to monitor spawning escapement.

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Snake R. Spr/ Summer Chinook (cont.)	Upper Salmon R. (cont.)	Upper Salmon R.		Sawtooth Isolated Fishery Hatchery Program. 3rd phase of Idaho Supplementation Studies BPA/LSRCP funded. ESA Section 7 consultation pending an updated HGMP	2004	**Unknown** Too early to determine if Recovery Supplementation Program was successful or the effects of the recent transition to an Isolated Program. Primary/best production areas are above Sawtooth Hatchery. Part of Idaho Supplementation study to be completed in 2012.	Monitor to determine if hatchery adults are only spawning naturally immediately below weir. Increase well water supply (pathogen free source) to fulfill production targets and to reduce disease problems. Improve spawner surveys below the hatchery weir. Develop broodstock management plan, discontinue ISS Phase III and reinitiate supplementation (Nez Perce).
		Panther Crk	Passage through the Federal Columbia River Power System and water quality and channel complexity conditions that limit spawning and rearing success.	None	NA	**No Effect**	Potential for future Chinook reintroduction if mining cleanup is successful and mainstem survival is improved.

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Snake R Steelhead	Lower Snake	Tucannon R. A-run steelhead		Tucannon Isolated Fishery Program BPA/LSRCP funded ESA Section 7 consultation pending an updated HGMP	1983	- because non DPS broodstock are isolated from most but not all Tucannon steelhead spawning areas. The existing hatchery weir is 70% effective and the most important habitat is upstream.	Phase out use of non Distinct Population Segment (DPS) broodstock and develop a locally derived broodstock, possibly using captive broodstock technology. Relocate the weir to increase its effectiveness (Nez Perce & WDFW).
				Tucannon Supplementation Program BPA/LSRCP funded ESA Section 10 permit pending an updated HGMP and NEPA	2001	+ because the supplementation program is intended to preserve and build genetic resources and boost the number of natural spawners. To early for any significant results.	Improve weir to benefit broodstock collection, eliminate out-of-DPS strays, and improve management of spawning escapement.
		Asotin Crk A-run steelhead		None	NA	**Unknown** 2005 survey revealed large numbers of unmarked steelhead in Asotin Crk. The origin of these fish needs to be determined.	Continue to fund operation of the existing weir and spawning escapement. Fund genetic analysis of existing samples (WDFW).

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Snake R Steelhead (cont.)	Clearwater	L Clearwater A-run steelhead (unique for the Clearwater)		None	NA	**No Effect** No straying based on limited surveys	None. Improve monitoring of spawning escapement. Develop adult collection and juvenile acclimation facilities for supplementing NPT reservation tributaries. Place a weir in the Potlatch River (FWP proposal).
		SF Clearwater B run steelhead.		Dworshak and Clearwater Fishery and Supplementation Program Dworshak funded by COE, Clearwater program funded by BPA/LSRCP. ESA Section 7 consultation pending an updated HGMP	1992	**Unknown** Inadequate evaluation of these programs. 200k Dworshak Hatchery smolts planted for supplementation. About 1 million smolts are released annually without adequate evaluation of their naturally spawning and potential impacts. Straying is low (<10 fish over the last 5 years) based on weir operation in the Crooked and Red rivers.	Improve monitoring of spawning escapement. Continue recently initiated evaluation (USFWS). More evaluation is necessary before assessing options for donor stock originating within the South Fork Clearwater River. Identify new facilities needed to develop local stock.

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Snake R Steelhead (cont.)	Clearwater (cont.)	NF Clearwater B run steelhead	Extirpated The Federal Dworshak Dam has taken this area out of steelhead production.	Dworshak Fishery Program COE funded. ESA consultation pending an updated HGMP	1969	+ because whatever NF Clearwater genetic resources that remain exist in this program.	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams.
		Lolo Creek B run steelhead.		Dworshak BPA/LSRCP funded. ESA Section 7 consultation pending an updated HGMP	1999	**Unknown** Releases 50,000 smolts annually with inadequate evaluation.	Improve monitoring of spawning escapement. Assess options for developing locally derived broodstock.
		Selway River B run steelhead	Passage through the Federal Columbia River Power System. Spawning and rearing areas are in Wilderness system.	None	NA	**Unknown**	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams.
Snake R Steelhead (cont.)	Clearwater (cont.)	Lochsa River B run steelhead	Passage through the Federal Columbia River Power System. Spawning and rearing areas are largely in wilderness & roadless systems.	None	NA	**Unknown** Only 1-3% stray rate from Dworshak program (Fish Crk weir in lower Lochsa).	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams.

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	Salmon River	Little Salmon & Rapid A run steelhead		Little Salmon Fishery Program Idaho Power Company and BPA/LSRCP funded. ESA Section 7 consultation pending an updated HGMP	1980s	**Unknown or No Effect** in Rapid River. – because naturally spawning hatchery fish (derived from outside the DPS) poses a potential risk to Little Salmon R. pop diversity and productivity. Inadequate evaluation of escapement and natural spawning of hatchery fish.	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams. Terminate release of unmarked hatchery fish. Collect samples and conduct genetic analysis for fish from the Little Salmon (IDFG). Terminate release of Dworshak B steelhead.
		SF Salmon R. B run steelhead		None	NA	**No Effect**	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams.
Snake R Steelhead (cont.)	Salmon River (cont.)	Secesh River B run steelhead		None	NA	**No Effect**	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams.

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		Big, Camas, Loon Creeks B run steelhead	Passage through the Federal Columbia River Power System. Spawning and rearing areas are in wilderness system.	None	NA	**No Effect**	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams.
		UMF Salmon R. B run steelhead	Same as above	None	NA	**No Effect**	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams.
		Chamberlain Crk A-run steelhead	Same as above	None	NA	**No Effect**	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams.
Snake R Steelhead (cont.)	Salmon River (cont.)	Panther Crk A-run steelhead	Extirpated due to mining effects.	Panther Crk egg box releases	1997	**Unknown** Experimental reintroductions with egg boxes using Pahsimeroi fish	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams.

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		NF Salmon R. A-run steelhead				-because naturally spawning hatchery fish derived from areas outside the DPS pose a potential risk to pop diversity and productivity.	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams. Eliminate main-stem Salmon River releases in this reach (Nez Perce). Provide acclimation and adult collection facilities to reduce potential risk to diversity. Terminate direct stream releases of out of DPS hatchery fish.
Snake R Steelhead (cont.)	Salmon River (cont.)	Lemhi R. A-run steelhead				- because naturally spawning hatchery fish derived from areas outside the DPS pose a potential risk to pop diversity and productivity.	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams. Terminate release of Pahsimeroi hatchery fish. Terminate mainstem Salmon River releases in this reach (Nez Perce).

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		Pahsimeroi R A-run steelhead		Pahsimeroi Isolated Fishery Program Idaho Power Company funded ESA Section 10 permit pending an updated HGMP and NEPA	1969	**No Effect** on the ESA protected DPS. Strictly harvest mitigation for 3 private Hells Canyon Dams. A weir near the confluence with the Salmon River allows only natural fish to escape into spawning areas. + because genetic resources for areas taken out of production by the Hells Canyon Dams are contained in this program.	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams. Develop a local broodstock.
Snake R Steelhead (cont.)	Salmon River (cont.)	EF Salmon R. A-run steelhead		East Fork Program BPA/LSRCP funded ESA Section 10 permit pending an updated HGMP and NEPA	2003	+ Recovery Program temporarily boosts the number of natural spawners until factors limiting survival are addressed. The population is at about 10% of its abundance goal.	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams.

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		EF Salmon R. A-run steelhead (cont.)		East Fork Fishery Program/Squaw Crk Pond	1982	**Unknown** because naturally spawning hatchery fish (in the lower 6 miles of the East Fork) derived from areas outside the basin (NF Clearwater/Dworshak) pose a potential risk to pop diversity and productivity.	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams. Terminate Dworshak B releases and replace with locally derived source.
Snake R Steelhead (cont.)	Salmon River (cont.)	Upper Salmon R. A-run steelhead		Sawtooth Isolated Fishery Program (includes Yankee Fork and mainstem Upper Salmon R. releases) BPA/LSRCP funded. ESA Section 7 consultation pending an updated HGMP	1983	**-** because naturally spawning hatchery fish are derived from outside the DPS and pose a potential risk to pop diversity and productivity.	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams. Terminate release of out of DPS hatchery fish into Valley Creek and Yankee Fork. Develop local upper Salmon River stock. Develop locally derived stock from Yankee Fork for supplementation into that tributary.

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Snake R Steelhead (cont.)	Grande Ronde	Wallowa R., (includes the Minam and Lostine rivers), A-run steelhead	Passage through the Federal Columbia River Power System. Spawning and rearing areas are in a wilderness system.	Wallowa Isolated Fishery Program at Wallowa Hatchery and at Big Canyon Pond. BPA/LSRCP funded ESA Section 7 consultation pending an updated HGMP	1982	- because hatchery fish are derived from areas outside the DPS and naturally spawning hatchery fish pose risk to pop diversity and productivity. - because Wallowa steelhead strays pose risk to Deschutes and John Day steelhead populations. Planted steelhead reduced from 1.3 million to 870,000. The Minam R. is managed for wild production only	Improve monitoring of spawning escapement to determine if hatchery adults stray into nearby streams or into other populations and DPSs. Reduce number of juveniles produced.
		Joseph Crk A-run steelhead		None	NA	**No Effect** No straying based on surveys.	Improve escapement and natural productivity monitoring.
		Up Gr Ronde R. A-run steelhead		None	NA	**No Effect** Hatchery releases suspended in 1997. Less than 1% straying from other areas.	Continue monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams. CTUIR operates weirs on Catherine Crk and on the upper Grande Ronde.

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Snake R Steelhead (cont.)	Grande Ronde (cont.)	Lwr Gr Ronde R.,		Cottonwood Pond Isolated Fishery Program BPA/LSRCP funded. ESA Section 7 consultation pending an updated HGMP	1982	- because hatchery fish are derived from areas outside the DPS and naturally spawning hatchery fish pose a potential risk to pop diversity and productivity in Cottonwood, Rattlesnake and Menatchee creeks.	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams. Transition to locally derived broodstock.
		Wenaha River A-run steelhead	Wenaha in wilderness.	None	NA		
	Imnaha	Imnaha River A-run steelhead		Little Sheep Fishery/ Recovery Program BPA/LSRCP funded. ESA Section 10 permit pending an updated HGMP and NEPA	1999	**Unknown,** but Broodstock comprised of >10% natural origin fish in only 6 of last 14 years and natural origin fish comprised >50% of the natural spawners in only 2 of last 14 years (high hatchery influence). Surveys indicate little or no straying by Little Sheep program fish.	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams. Incorporate natural adults from Big Sheep Creek and increase the proportion of natural-origin fish in the hatchery broodstock. Develop guidelines for reducing the proportion natural spawners comprised of hatchery fish (ODFW).

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Snake R Steelhead (cont.)	Hells Canyon	Hells Canyon Tribs A run steelhead		Oxbow/Niagara Springs Isolated Fishery Program Idaho Power funded. ESA Section 10 permit pending an updated HGMP and NEPA	1984	- because straying by these fish poses potential risk to population productivity. The Oxbow program operates strictly to provide fishing opportunity as mitigation for the 3 private Hells Canyon Dams. Inadequate evaluation of this program to determine effects on steelhead viability. + because genetic resources for areas taken out of production by the Hells Canyon Dams are contained in the program.	Improve monitoring of spawning escapement to determine if hatchery adults stray to nearby natural production streams. Consider a program to reintroduce steelhead into Pine Crk (ODFW).
		Powder River	Extirpated Taken out of production by the 3 private Hells Canyon Dams	None	NA	**Extirpated Population**	None
		Burnt River	Extirpated Taken out of production by the 3 private Hells Canyon Dams	None	NA	**Extirpated Population**	None
		Weiser River	Extirpated Taken out of production by the 3 private Hells Canyon Dams	None	NA	**Extirpated Population**	None

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Snake R. Fall Chinook	Snake Mainstem	Lower Mainstem Snake R	More than 80% of the populations spawning area is blocked by Private Utility Dams and passage through the Federal Columbia R. Power System. Since proposed for ESA protection in 1990, the population has grown from <100 annual returns to between 2100 and 5100. Available habitat may now be the primary limiting factor. Hatchery strays from outside the basin pose a risk (approx 1100 in 2003). Reduced harvest has contributed to increased natural spawners. Fishing impacts from all fisheries (ocean and in-river) were 66% between 1980-1995 and 45% between 1996 and 2003 (NMFS 05 Biological Opinion). Total in-river harvest rates averaged 55% between 1986 and 1991 and 26% between 1992 and 2003 (CRIFC personal comm).	Lyons Ferry program Fall Chinook Acclimation Project (FCAP) at Pittsburg Landin, Capt. John Rapids and Big Canyon. BPA/LSRCP. ESA Section 10 permit pending an updated HGMP and NEPA	1985	+ because it has successfully jumpstarted natural production and improved spatial distribution. Also because the program includes genetic resources from areas taken out of production by the Hells Canyon Dams (i.e., the Marsing and Salmon Falls reaches). Since proposed for ESA protection in 1990, the population has grown from <100 annual returns to between 2100 and 5100. Hatchery intervention has accomplished its mission and successfully jumpstarted fall Chinook production. Acclimation facilities located in natural spawning areas. Pop abundance has been at or above the ESA recovery threshold in 2001and 03 (the ICTRT abundance threshold is 3,000 natural-origin spawners). Productivity of natural origin fish has been >1:1. Continued high hatchery influence poses potential risks to the population. productiity and diversity. The proportion of naturally spawning HOF> proportion of NOF in the hatchery broodstock since 1992.	Improve M&E of natural spawners and reproductive success of hatchery and natural adults. Increase proportion of natural fish into the hatchery broodstock. Promote population diversity by expanding adult collection capabilities in the Clearwater River and Hells Canyon. Develop long-term plan for reducing hatchery fish influence in some areas (i.e., proportion of hatchery fish spawning naturally) and eliminate hatchery fish juvenile releases in other areas to reduce risks to pop productivity and diversity. Control out of basin hatchery strays, primarily from the Umatilla River. Options include; increase removal of strays at Lower Granite Dam and improve the homing fidelity of Umatilla program. Increase Lwr Granite PIT tag sampling capabilities to M&E hatchery program performance.

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Snake R. Fall Chinook (cont.)	Snake Mainstem (cont.)	Clearwater R.	Passage through the Federal Columbia River Power System. See lower Mainstem above for fishing impacts.	Nez Perce Recovery and Fishery Program BPA funded. ESA Section 10 permit pending an updated HGMP and NEPA	1999	+ because the program has jump-started production by boosting the number of natural spawners and increasing spatial distribution. All releases are subyearling and all are marked. 400,00 of the intended 1.4 million releases designed to restore extinct early spawning life history form.	Increase proportion of natural fish in the hatchery broodstock. Reduce reliance on collecting broodstock at Lyons Ferry Hatchery and Lower Granite Dam for Clearwater River supplementation program. Promote population diversity by relying on adults returning to the Clearwater River. Develop an early spawning broodstock for introduction into the middle Fork Clearwater River. Collectively these actions should promote diversity by allowing local adaption to occur over time.

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Snake R. Fall Chinook (cont.)	Snake Mainstem (cont.)	Snake R Mainstem	See Lower Mainstem	Oxbow Isolated Fishery Program Idaho Power funded. ESA Section 10 permit pending an updated HGMP and NEPA	2001	- now because hatchery broodstock practices are isolated and because the high influence of hatchery origin fish (proportion of hatchery origin natural spawners > proportion of natural origin natural spawners) increases risk to population productivity and diversity. Managing Snake River fall Chinook as a single aggregate impedes the development of population diversity and potentially reduces productivity.	Monitor to determine if Hells Canyon Dam releases are isolated. Develop adult collection facilities at Hells Canyon Dam. Reduce reliance on collecting broodstock at Lyons Ferry Hatchery if the program is intended to produce fish that spawn naturally. Reduce proportion of hatchery fish in natural production areas. Reprogram hatchery releases out of a natural production area once natural returns exceed recovery objectives for one generation (to help determine if natural fish are self sufficient). Control out of basin hatchery strays, primarily from the Umatilla River. Options include; increase removal of strays at Lower Granite Dam and improving Umatilla program Chinook homing fidelity.

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Snake R. Fall Chinook (cont.)	Snake Mainstem (cont.)	Marsing Reach	Extirpated Taken out of production by 3 private Hells Canyon Dams	None	NA	**Extirpated Population**	
		Salmon Falls	Extirpated Taken out of production by 3 private Hells Canyon Dams	None	NA	**Extirpated Population**	
Snake R. Sockeye		Redfish Lake		Stanley Basin Captive Broodstock Program BPA funded. ESA Section 10 permit is pending,	1991	+ for preserving and building sockeye genetic resources until the factors limiting survival are addressed.	Expanded facilities are needed to increase production of hatchery smolts to put available genetic resources to use and jumpstart or boost the number of natural spawners.
		Alturas Lake		Reintroductions form the Stanley Basin Recovery Program	1990s	+ for reintroducing sockeye into this system.	Same as above
		Pettit Lake		Reintroductions from the Stanley Basin Recovery Program	1990s	+ for reintroducing sockeye into this system.	Same as above
		Yellowbelly Lake		None	NA	None	
		Stanley Lake		None	NA	None	

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Upper Columbia Spring Chinook	Wenatchee/ Methow	Wenatchee R.	Passage through the Federal Columbia River Power System and through three mainstem Columbia River Public Utility Dams, Leavenworth National Fish Hatchery strays and fish passage, stream flow, stream temperature, sedimentation and channel complexity conditions that limit spawning and rearing success. In Icicle Crk, fish passage, inadequate hatchery water diversion screening and late summer water quality and quantity limit productivity. Total mainstem treaty and non-treaty harvest rates averaged 27% between 1960 and 1991 and 8% between 1992 and 2005 (CRIFC personal comm). Nearly zero ocean fishing impacts	Leavenworth National Fish Hatchery Isolated Hatchery Program operated to mitigate for areas taken out of spring chinook production by Federal Dam (Grande Coulee) construction and is designed to provide fish for treaty and public fishing. 92% BPA and 8% BOR funded. ESA Section 7 consultation is in place.	1940	- because straying from the program poses a potential risk to population diversity and productivity. Hatchery stock is not indigenous to the Wenatchee Basin, not included in the Upper Columbia Spring Chinook ESU, and they may comprise >5% of the natural spawners in areas important to spring Chinook recovery.	Identify actions that would reduce straying by better isolating the program or that would reduce the impacts of limited straying by integrating the program. Consider transitioning to Chinook derived from Wenatchee Basin MSAs (e.g., surplus Chiwawa program fish collected at Tumwater Dam). Consider trapping Leavenworth hatchery strays at Tumwater Dam as a means to reduce impacts to primary production areas upstream (USFWS). For Chinook viability in Icicle Crk, develop Icicle Crk broodstock, improved adult passage and a redesigned screen over the hatchery water intake is needed.

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Upper Columbia Spring Chinook (cont.)	Wenatchee/ Methow (cont.)	Wenatchee R. (cont.)	Same as above.	Chiwawa Program. Integrated Hatchery Program designed to help Chiwawa Chinook become self-sustaining. Returning hatchery fish surplus to recovery needs can serve other purposes. Funded by Chelan County PUD for construction and continued operation of Rock Island Dam. ESA Section 10 permit #1196 is in place.	1989	+ because the program has successfully jumpstarted Chinook production in the Chiwawa River and because it sustains spatial structure and the number of natural spawners until the factors limiting natural productivity are addressed. - because naturally spawning hatchery fish pose a potential risk to pop productivity and diversity in the Chiwawa and White rivers. The number of juveniles planted into the Chiwawa sometimes results in larger adult returns than are needed to support recovery in the Chiwawa. Stray rates are high (>25%).	Smolt releases in the Chiwawa should match the capacity of existing habitat in the Chiwawa. Changes smolt release sites to reduce straying. Establish protocols for reducing hatchery influence (PNI) phasing out the program as Chiwawa River Chinook become self-sustaining (NOAA). Develop additional acclimation/release sites to distribute returning adults throughout the watershed i.e., Nason Crk. Move broodstock collection to Tumwater Dam to incorporate genetic material from all spawning aggregates in the Wenatchee (Yakama Nation). In short-term, protocols should focus on increasing HOR & NOR natural spawners in spawning aggregates that have small numbers (Yakama Nation).

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Upper Columbia Spring Chinook (cont.)	Wenatchee/ Methow (cont.)	Wenatchee R. (cont.)	Passage through the Federal Columbia River Power System and through three mainstem Columbia River Public Utility Dams, Chiwawa hatchery program strays. See Wenatchee for fishing impacts.	White River Program. Captive Broodstock Program designed to help White River Chinook become self-sustaining. Funded by Grant County PUD to mitigate for fish losses fom construction and operation of Priest Rapids Dam. ESA Section 10 permit is pending the development of an HGMP.	1999	+ Recovery Program that is preserving and building genetic resources until limiting factors are addressed.	Provide rearing and acclimation facilities, provide facilities to collect and monitor adult returns to the White River and establish protocols for phasing out the program as White River chinook become self-sustaining. Close the existing program and reallocate funds to address in-basin limiting factors (Yakama Nation). Expand natural acclimation facilities in the Little Wenatchee River with broodstock collection at Tumwater Dam (Yakama Nation).

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Upper Columbia Spring Chinook (cont.)	Wenatchee/ Methow (cont.)	Entiat River	Passage through the Federal Columbia River Power System and four mainstem Columbia River Public Utility Dams, naturally spawning hatchery origin fish from Entiat National Fish Hatchery and fish passage, channel complexity and water quality conditions that limit spawning and rearing success. See Wenatchee for fishing impacts.	Entiat National Fish Hatchery Isolated Hatchery Program operated to mitigate for areas taken out of spring Chinook production by Federal Dam Construction and designed to provide fish for treaty and public fishing. 92% BPA and 8% BOR funded to replace fish losses from Grande Coulee Dam construction. ESA Section 7 consultation in place but new information is expected to trigger reinitiation of consultation	1974	- because the program is not well isolated and naturally spawning hatchery fish pose substantial risk to population diversity and productivity. Entiat Hatchery Chinook are not indigenous to the Entiat and not included in the UCR spring Chinook ESU	1. Discontinue the Isolated Hatchery Program, 2. determine whether hatchery intervention to support Chinook recovery is appropriate, and 3. if hatchery intervention is determined appropriate, develop a new Hatchery and Genetic Management Plan for the Entiat. Develop a local broodstock from the natural spawning population and implement acclimated smolt releases at suitable sites in the upper Entiat Basin (Yakama Nation). Reprogram the hatchery to propagate summer Chinook which will decrease impacts on spring Chinook (Yakama Nation).

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Upper Columbia Spring Chinook (cont.)	Wenatchee/ Methow (cont.)	Methow R.	Passage through the Federal Columbia River Power System and through five mainstem Columbia River Public Utility Dams and stream flow, channel complexity, sedimentation and passage conditions that limit spawning and rearing success. See Wenatchee for fishing impacts	Winthrop National Fish Hatchery Phasing into an Integrated Program to boost the number of natural spawners and help spring Chinook become self-sustaining. Returning hatchery fish surplus to recovery needs can be used for other purposes. 92% BPA and 8% BOR funded to replace fish losses from the construction of Grande Coulee Dam. ESA Section 10 permit # 1300 is in place.	2001	+ for preserving genetic resources when Chinook returns dropped to unprecedented low numbers and for sustaining naturally spawning and the spatial structure of Chinook until factors limiting Chinook productivity are addressed. - because very few natural origin fish are incorporated into the broodstock program and because combining Methow R and Chewuch R fish for hatchery broodstock reduces pop diversity.	Develop individual properly Integrated Hatchery Programs (including supporting broodstock collection facilities and RM&E) for the Chewuch River and the mainstem Methow River that include the ability to collect natural-origin fish for broodstock, rear progeny separately and manage the proportion of natural spawners comprised of returning hatchery fish. Reduce hatchery influence on natural-origin fish as natural-origin Chinook viability improves. Ensure that program smolt release goals are met, improve juvenile acclimation sites (distributed at suitable locations in the watershed), enhance hatchery water supply and improve Bacterial Kidney Disease management options (Yakama Nation).

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Upper Columbia Spring Chinook (cont.)	Wenatchee/ Methow (cont.)	Methow R. (cont.)	Same as above	Methow Program Developing an Integrated Program to boost the number of natural spawners and help spring Chinook become self-sustaining. Returning hatchery fish surplus to recovery needs can be used for other purposes. Douglas County PUD funded to mitigate for fish losses from construction and operation of Wells Dam. ESA Section 10 permit #1196 is in place.	1998	+ for preserving genetic resources when Chinook returns dropped to unprecedented low numbers and for sustaining the natural spawning and spatial structure of Chinook until the factors limiting Chinook productivity are addressed. - because very few natural origin fish are incorporated into the broodstock program and because combining Methow R and Chewuch R fish for hatchery broodstock reduces pop diversity. Hatchery fish comprised 97% of the broodstock in 2001, 02 and 03. For this same period, 96% of the naturally spawning fish in the Methow R have been hatchery origin (high hatchery influence).	Develop individual properly Integrated Hatchery Programs for the Chewuch River and the mainstem Methow River that include the ability to collect natural-origin fish for broodstock, rear progeny separately manage the proportion of natural spawners comprised of returning hatchery fish and conduct RM&E to determine performance and facilitate adaptive management. Reduce hatchery influence on natural-origin fish as natural-origin Chinook viability improves. Ensure that program smolt goal is met, improve and expand juvenile acclimation/release sites in the watershed, enhance hatchery water supply and improve Bacterial Kidney Disease management options (Yakama Nation).

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Upper Columbia Spring Chinook (cont.)	Wenatchee/ Methow (cont.)	Methow R.	Same as above	Twisp Program Integrated Program designed to boost the number of natural spawners and help Twisp Chinook become self sustaining. Funded by Douglas County PUD to mitigate for fish losses from the construction and operation of Wells Dam. ESA Section 10 permit #1196 is in place	1992	+ for preserving genetic resources and temporarily boosting the number of natural spawners. Broodstock comprised of 57% hatchery origin fish between 2001 and 2003. Natural spawners comprised of 47% hatchery origin fish between 1998 and 2003 (high hatchery influence).	Modify the Twisp trap to allow the collection of broodstock and to avoid impacts to spring Chinook spatial distribution. Reduce hatchery influence on natural-origin fish as natural-origin Chinook viability improves.

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Upper Columbia Spring Chinook (cont.)	Wenatchee/ Methow (cont.)	Okanogan R.	Extirpated	Okanogan Fishery Program 92% BPA and 8% BOR funded. ESA Section 10 permit #1300 is in place.	Sporadically since 2001	**No Effect** Surplus non ESU out of basin fish from Winthrop NFH are released into vacant habitat	Implement Okanogan reintroduction HGMP & Master Plan using Methow donor fish (Colville Tribe). Test live-capture selective gear to collect hatchery broodstock & remove hatchery returns surplus to recovery needs while reducing harvest impacts on the population (Colville Tribe).
	Kettle/Colville	Sanpoil R.	Extirpated Grande Coulee Dam blocked all passage	None	NA	**Extirpated Population**	
		Kootenay R	Extirpated Grande Coulee Dam blocked all passage	None	NA	**Extirpated Population**	
		Kettle/Colville	Extirpated Grande Coulee Dam blocked all passage	None	NA	**Extirpated Population**	
	Spokane	Spokane R	Extirpated Grande Coulee Dam blocked all passage	None	NA	**Extirpated Population**	
		Hangman Crk	Extirpated Grande Coulee Dam blocked all passage	None	NA	**Extirpated Population**	

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Upper Columbia R Steelhead	Entiat	Entiat R.	Passage through the Federal Columbia River Power System and through four mainstem Columbia River Public Utility Dams, and fish passage, channel complexity and water quality conditions that limit spawning and rearing success. For fishing impacts, see Wenatchee (below).	None	NA	**Unknown.** Straying from hatcheries outside the Entiat poses a potential risk to population productivity and diversity. Hatchery releases were discontinued in 1997. The Entiat Basin is now managed for natural production only.	Rare opportunity here to conduct scientific research and compare the progress and pace of recovery with and without hatchery intervention.

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Upper Columbia R Steelhead (cont.)	Wenatchee	Wenatchee R.	Passage through the Federal Columbia River Power System and through three mainstem Columbia River Public Utility Dams, and fish passage, stream flow, stream temperature, sedimentation and channel complexity conditions limit spawning and rearing success. Fishing impacts averaged 13% in the mainstem Columbia and 2.5% in the Wenatchee between 1985 and 1997 and 5% in the mainstem and zero in the Wenatchee after 1997.	Wenatchee Program Chelan County Public Utility District funded. ESA Section 10 permit #1395 is in place.	1996	+ for preserving and developing steelhead genetic resources and for boosting the number of natural spawners. This program reformed its broodstock collection practices phasing out Wells stock beginning in 1996. Now only uses known local Wenatchee fish and natural-origin fish have comprised 55% of the broodstock since 1998. Spawn timing the same for hatchery and natural-origin fish. Approx 50% of the hatchery fish are AD clipped and the rest are elastomer tagged. - because high stray rates (20-40% measured upriver at Wells Dam) pose potential risks to Entiat, Methow and Okanogan steelhead diversity and productivity. The program intentionally mixes Chiwawa and Nason steelhead.	1. Radio tracking would determine where hatchery fish are actually spawning and the threat to steelhead diversity and productivity. 2. Develop facilities that mimic natural water conditions for acclimating smolts and maturing adults. 3. Accelerate the start of fitness studies to determine hatchery fish productivity in the wild. 4. Develop program(s) that preserve and develop Chiwawa River and Nason Creek steelhead stock structure including RM&E to determine performance and facilitate adaptive management. Reduce hatchery influence on natural-origin fish as natural-origin steelhead viability improves.

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Upper Columbia R Steelhead (cont.)	Methow	Methow R. There are 4 major spawning aggregates (MSA) of steelhead in the Methow system. All MSAs are at low risk for spatial distribution and high risk for genetic diversity.	Passage through the Federal Columbia River Power System and through five mainstem Columbia River Public Utility Dams, and channel complexity, stream flow, fish passage and sedimentation conditions that limit spawning and rearing success. See Wenatchee for fishing impacts.	Wells Program The program is poorly Integrated (mixes MSAs and uses few natural-origin fish) and intends to boost the number of natural spawners. Douglas County PUD funded. ESA Section 10 permit #1395 is in place	1982	+ for stepping in to preserve genetic resources and boosting the number of naturally spawning fish when natural origin steelhead returns were < 200 fish for 5 of 6 years between 1993 and 1998. - for risks to pop diversity and productivity by collecting broodstock at Wells Dam and then introducing these fish in different areas throughout the Methow Basin. Hatchery origin fish comprise >90% of all natural spawners which also poses risks to pop diversity and productivity.	Develop facilities to promote stock structure and reduce risks to pop diversity and productivity. 1. Develop, fund and follow new Hatchery and Genetic Management Plan(s) for individual MSA or MSAs that includes RM&E and protocols for phasing out hatchery influence as steelhead viability improves.
			Same as above	Winthrop National Fish Hatchery 92% BPA and 8% BOR funded. ESA Section 10 permit #1396 is in place	1951	Same as above	Same as above

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Upper Columbia steelhead (cont.)	Okanogan	Okanogan R.	Passage through the Federal Columbia River Power System, five mainstem Columbia River Public Utility Dams, and stream temperature, sedimentation, fish passage, water quality and stream flow conditions that limit spawning and rearing success. Hatchery practices at the Wells program may be depressing natural productivity. See Wenatchee for fishing impacts.	Wells Program The program is poorly Integrated (mixes MSAs and uses few natural-origin fish) and intends to boost the number of natural spawners. Douglas County PUD funded. ESA Section 10 permit #1395 is in place	1982	+ for stepping in to preserve genetic resources and boosting the number of naturally spawning fish when natural origin steelhead returns were < 200 fish for 5 of 6 years between 1993 and 1998. - for risks to pop diversity and productivity by collecting broodstock at Wells Dam and then introducing these fish in different areas throughout the Okanogan Basin. Hatchery origin fish comprise >90% of all natural spawners (high hatchery influence) which also poses a potential risk to pop diversity and productivity.	Same as above Upgrade & expand broodstock collection and rearing capability at Cassimer Bar and use strictly Okanogan fish to increase the number of natural spawners (Colville Tribe). Test live-capture selective gear to collect hatchery broodstock & remove hatchery returns surplus to recovery needs while reducing harvest impacts on the population (Colville Tribe).
			Same as above	Omak Crk Program BPA funded. ESA Section 10 permit #1412 is in place.	2003	+ for preserving and building genetic resources and boosting the number of natural spawners	
			Same as above	Salmon Crk Program	2007	+ for preserving and building genetic resources and boosting the number of natural spawners	This program will coincide with improved flows in Salmon Crk provided by the Okanogan Irrigation District.

Evolutionarily Significant Unit or Steelhead Distinct Population Segment	Major Population Group or Strata	Population	Major Factor(s) Currently Limiting Population Recovery	Hatchery Program	Year the Current Hatchery Program was Initiated	Hatchery Effects on Population Viability + Denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability	New Hatchery Actions that Potentially Could Contribute to Recovery
Upper Columbia steelhead (cont.)	Kettle/Colville	Sanpoil R.	Grande Coulee Dam Blocked all passage	None	NA	**Extirpated Population**	
		Kettle/Colville	Grande Coulee Dam blocked all passage	None	NA	**Extirpated Population**	
		Pend Oreille R	Grande Coulee Dam blocked all passage	None	NA	**Extirpated Population**	
		Kootenay R	Grande Coulee Dam blocked all passage	None	NA	**Extirpated Population**	
	Spokane	Spokane R	Grande Coulee Dam blocked all passage	None	NA	**Extirpated Population**	
		Hangman Crk	Grande Coulee Dam blocked all passage	None	NA	**Extirpated Population**	

For a complete list of literature cited, see the Supplemental Comprehensive Analysis, Chapter 12