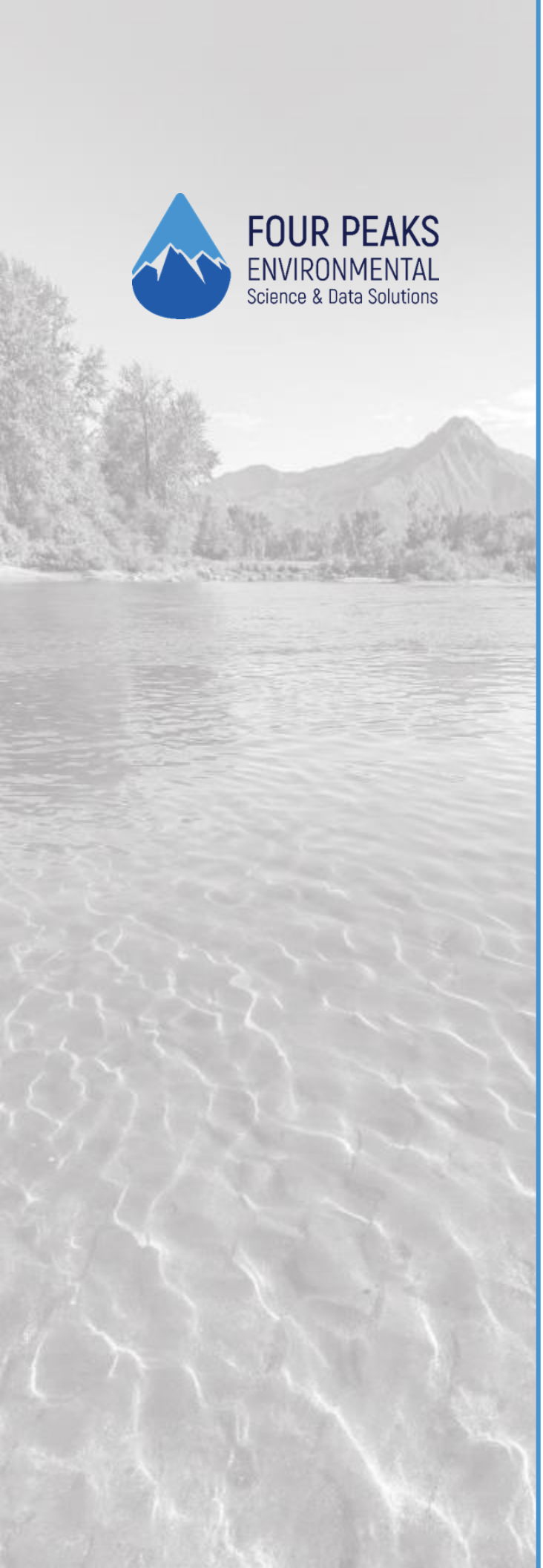

FOUR PEAKS ENVIRONMENTAL
Science & Data Solutions

REVIEW OF REGULATORY APPROVAL PROCESS AND MANAGEMENT REQUIREMENTS FOR HATCHERY PROGRAMS IN OREGON

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Abbreviations

Abbreviation	Definition
BA	Biological Assessment
DPS	Distinct Population Segment
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FHMP	Fish Hatchery Management Policy
HGMP	Hatchery and Genetic Management Plan
HPMP	hatchery program management plan
NEPA	National Environmental Policy Act
NLAA	Not Likely to Adversely Affect
NOAA Fisheries	National Oceanic and Atmospheric Administration Fisheries Service
NPDES	National Pollutant Discharge Elimination System
OAR	Oregon Administrative Rules
ODFW	Oregon Department of Fish and Wildlife
OHRC	Oregon Hatchery Research Center
Services	combined National Oceanic and Atmospheric Administration Fisheries Service and U.S. Fish and Wildlife Service
SMU	species management unit
STEP	Salmon and Trout Enhancement Program
USFWS	U.S. Fish and Wildlife Service

Executive Summary

In the state of Oregon, approximately 42 million hatchery-produced Pacific salmon, steelhead, and trout are planted into public waters annually. The Oregon Department of Fish and Wildlife (ODFW) operates 33 fish hatcheries plus 13 rearing ponds, acclimation sites, and trapping facilities. The primary purpose of most hatchery programs is to support recreational and commercial fisheries. Other programs are focused on conservation of depleted, threatened, or endangered populations and the reintroduction of native species. Although hatchery programs are intended to provide a positive benefit for fisheries or conservation, interaction between hatchery and wild populations occurs with potential risk to wild populations. The ODFW has developed policies to guide the design and implementation of hatchery programs to reduce potential negative impacts of hatchery fish on wild populations while still achieving programmatic goals. In addition, hatchery programs that culture or potentially interact with U.S. Endangered Species Act (ESA) threatened or endangered populations must comply with the terms and conditions and reasonable and prudent measures resulting from consultations under the ESA.

Hatchery programs designed to augment or provide harvest opportunities have successfully supported commercial, tribal, and recreational fisheries. These fisheries contribute to both economic and cultural aspects of societies. Harvest hatchery programs are managed to ensure risk to naturally produced native fish is within acceptable and clearly defined limits. Conservation hatchery programs play an important role in supplementing natural populations, reintroduction of species, and the conservation and recovery of imperiled populations. Conservation programs are designed to provide a survival advantage compared to survival in the natural environment while having minimal impact on genetic, ecological, and behavioral characteristics of natural populations. Hatcheries also serve an educational role in communities and schools, providing opportunities to learn about fish populations, biology, and conservation.

Although hatchery programs are operated with the goals of providing conservation or harvest benefits, all hatchery programs potentially impose risks on natural populations. The type and level of risk can vary with the type of program and the status of the natural population(s) it interacts with. Risks related to the operation of hatcheries fall into four broad categories: genetic, ecological, fish health, and environmental. Genetic risks occur because the hatchery environment differs from the natural environment to the extent that hatchery fish can genetically diverge from natural populations, potentially causing loss of fitness in the natural population. Ecological risks occur when hatchery fish detrimentally interact with natural-origin fish in the natural environment. Fish health risks occur because the operation of fish hatcheries has the potential to amplify pathogens and parasites, or to introduce novel pathogens, potentially putting natural populations at risk. Hatcheries must comply with environmental regulations to maintain water quality related to water withdrawals and discharge. Water must be properly treated and monitored when it is returned to a stream. The ODFW implements and complies with hatchery conservation and management strategies, policies, and plans to minimize impacts of hatchery programs on wild fish. These documents include The Native Fish Conservation Policy, the Fish Hatchery Management Policy, the Fish Health Management Policy, Hatchery Genetic and Management Plans, and the Conservation Plans for the State of Oregon. These policies and plans provide guidelines for the management of wild and hatchery fish in Oregon.

Many of the hatchery programs operated by ODFW may directly or indirectly interact with federally listed threatened or endangered salmonid species, necessitating consultation under the federal ESA. The consultation process to obtain authorization under the ESA for a hatchery program involves numerous

steps. The process entails development of a Hatchery and Genetic Management Plan (HGMP), initiation of consultation with the listing federal agency, and following the consultation process through each step, working with the federal agency. HGMPs are comprehensive plans describing all aspects of hatchery programs, facilities, and effects on natural populations. HGMPs are the instruments used in federal ESA consultation for hatcheries and are submitted to obtain authorization to operate hatchery programs under the ESA. ODFW has developed HGMPs for Oregon hatchery facilities which contain the specific program objectives and provide detailed information on the operational guidelines and management strategies for each program to achieve the objectives and to maintain the genetic integrity of the natural populations and hatchery programs. ESA authorizations typically contain reasonable and prudent measures and terms and conditions designed to minimize the risk of take of listed species. In addition, the federal listing agency must develop a recovery plan that may contain additional measures that are designed to minimize risk and enhance the probability of recovery of the listed species that could affect the hatchery program.

The ODFW has developed policy documents and management plans to address hatchery program operation, management practices to minimize impacts of hatchery programs on native fish populations, management practices for fish health in the fish hatcheries, and hatchery operational practices to avoid environmental impacts. The strategies in these hatchery conservation and management policies and plans are implemented to minimize impacts of hatchery programs on native, wild fish, including populations listed as threatened or endangered under the ESA. The ODFW has established a comprehensive approach to minimize the effects of hatchery programs on the native wild fishes of Oregon. These ODFW policies are also consistent with measures typically employed to minimize negative impacts on listed species.

1 Introduction

In the state of Oregon, approximately 42 million hatchery-produced Pacific salmon, steelhead, and trout are planted into public waters annually. The species planted include Chinook Salmon *Oncorhynchus tshawytscha*, Coho Salmon *O. kisutch*, steelhead trout *O. mykiss*, Chum Salmon *O. keta*, and resident trout species. The primary purpose of most hatchery programs is to support recreational and commercial fisheries. Other programs are focused on conservation of depleted, threatened, or endangered populations and the reintroduction of native species. Releases of hatchery fish typically occur within the native ranges of the species in river reaches where naturally reproducing native populations are present. Consequently, although hatchery programs are intended to provide a positive benefit for fisheries or conservation, interaction between hatchery and wild populations occurs with potential risk to wild populations. The Oregon Department of Fish and Wildlife (ODFW) has developed policy measures to guide the design and implementation of hatchery programs to reduce potential negative impacts of hatchery fish on wild population while still achieving programmatic goals. In addition, hatchery programs that culture or potentially interact with federal Endangered Species Act (ESA) threatened or endangered populations must comply with the terms and conditions and reasonable and prudent measures resulting from consultation under the ESA.

2 Status of Native Fish Species and Regulatory Overview

Currently, there are 23 federally-listed fish species (Evolutionarily Significant Units [ESU] or Distinct Population Segments [DPS])[1] in Oregon; 17 of these are trout, salmon, or steelhead species (i.e., salmonid species; Table 1). Four of the federally listed salmonid fish species are also listed under the Oregon Endangered Species Act (Table 1). ODFW has been identified as a state land owning or managing agency and has responsibilities under Oregon Administrative Rules (OAR) 635-100-0135[2] and 635-100-0140[3]. However, OAR 635-100-0170[4] states, "An incidental take permit shall not be issued for any species listed under the federal ESA. An incidental take permit or statement issued by a federal agency shall be considered a waiver of any state protection measures or requirements otherwise applicable to the actions allowed by the federal agency;" therefore this report focuses on the federal ESA regulatory process.

Table 1. State and Federal Threatened and Endangered Fish Salmonid Species in Oregon

ESU/DPS	Scientific Name	Status	
		State	Federal
Bull Trout (Range-Wide)	*Salvelinus confluentus*		Threatened
Columbia River Chum Salmon	*Oncorhynchus keta*		Threatened
Lahontan Cutthroat Trout	*Oncorhynchus clarkii henshawi*	Threatened	Threatened
Lower Columbia River Chinook Salmon	*Oncorhynchus tshawytscha*		Threatened
Lower Columbia River Coho Salmon	*Oncorhynchus kisutch*	Endangered	Threatened
Lower Columbia River Steelhead	*Oncorhynchus mykiss*		Threatened
Middle Columbia River Steelhead	*Oncorhynchus mykiss*		Threatened
Oregon Coast Coho Salmon	*Oncorhynchus kisutch*		Threatened
Snake River Chinook Salmon (Fall)	*Oncorhynchus tshawytscha*	Threatened	Threatened
Snake River Chinook Salmon (Spring/Summer)	*Oncorhynchus tshawytscha*	Threatened	Threatened
Snake River Sockeye Salmon	*Oncorhynchus nerka*		Endangered
Snake River Steelhead	*Oncorhynchus mykiss*		Threatened
Southern Oregon/Northern California Coast Coho Salmon	*Oncorhynchus kisutch*		Threatened
Upper Columbia River Spring Chinook Salmon	*Oncorhynchus tshawytscha*		Endangered
Upper Columbia River Steelhead	*Oncorhynchus mykiss*		Threatened
Upper Willamette River Chinook Salmon	*Oncorhynchus tshawytscha*		Threatened
Upper Willamette River Steelhead	*Oncorhynchus mykiss*		Threatened

Note:
Source: ODFW 2024a

Hatchery programs that propagate salmonid species are most likely to have negative interactions with native salmonid populations but may interact with non-salmonid species. This report focuses on

[1] Federally listed species are listed at the ESU or DPS level, where each ESU or DPS can include one or more closely related populations.
[2] Endangered Species Management Plans for State Land Owning or Managing Agencies Survival Guidelines for Species Listed as Threatened or Endangered https://oregon.public.law/rules/oar_635-100-0135
[3] Endangered Species Management Plans for State Land Owning or Managing Agencies https://oregon.public.law/rules/oar_635-100-0140
[4] Threatened and Endangered Species Incidental Take Permits https://oregon.public.law/rules/oar_635-100-0170

management of hatchery programs and how negative interactions with native salmonid populations are minimized.

Hatcheries generally need substantial volumes of water for operation. These volumes require water rights to withdraw water from surface or ground water supplies. In addition, the effluent from hatcheries is typically discharged to surface waters adjacent to the facilities and is regulated under the National Pollutant Discharge Elimination System (NPDES). Hatcheries that propagate less than 20,000 pounds of cold-water animals (fish) per year may not require a NPDES permit to operate (EPA 2024).

3 Overview of Hatchery Programs in Oregon

The ODFW operates 33 fish hatcheries plus 13 rearing ponds, acclimation sites, and trapping facilities. Of these hatcheries, 7 are federally funded, 9 are state funded, 14 are funded by a combination of state and federal funds, and 1 is funded by a power producer. In addition, the Oregon Legislature created ODFW's Salmon and Trout Enhancement Program (STEP) in 1981 to create opportunity for volunteers to participate in the restoration of native stocks of salmon and trout. One facet of STEP is working in collaboration with ODFW to culture and release trout and salmon. STEP's program goals are to rehabilitate and improve natural habitat and native fish stocks, ensure that harvest does not exceed fish population's reproductive capability, provide for citizen volunteer participation in achieving ODFW's fish management objectives, and support public education programs (ODFW 2024b).

Hatchery programs in Oregon propagate approximately 42 million fish annually, comprising numerous species across a variety of geographic locations. Hatchery programs support recreational, commercial, and treaty fisheries; mitigation obligations; and conservation efforts (McMillan et al. 2023). Losses to wild populations caused by overfishing, loss of habitat, and blockage of migratory routes resulted in the widespread use of hatcheries to boost fish abundance (Waples 1991). Hatchery program types are broadly categorized as harvest or conservation and are further delineated by the incorporation of natural origin broodstock (integrated) or maintain the hatchery program separately from the natural population by using only hatchery origin fish for broodstock (segregated). Integrated programs are designed to support natural populations or provide fisheries opportunity while reducing the genetic risks of domestication and loss of fitness. Segregated programs are designed to provide fisheries opportunity while having minimal interaction with natural origin populations, thus reducing the impact and risk of these programs (ODFW 2010; HSRG 2004, 2009; Figure 1). Some harvest programs are segregated from the natural population(s), while other programs, termed conservation/harvest, are integrated and designed with harvest and conservation goals. In addition, some harvest programs include natural origin fish in the broodstock (integrated) to minimize genetic risk to natural populations but are operated and managed for fisheries opportunity. Harvest programs are further divided into augmentation and mitigation programs. Mitigation programs are funded and operated to mitigate for an environmental impact, such as the effects of a hydroelectric project. Augmentation programs are non-mitigation programs that support fisheries. The integrated conservation/harvest programs function as both conservation and harvest programs, supporting both the natural population and contributing to harvest opportunities. These programs are sometimes stepping-stone programs intended to incorporate a progressively greater proportion of natural-origin fish in the broodstock to transition from harvest to conservation support programs. Conservation programs are subdivided into restoration/recovery and supplementation programs. Restoration/recovery programs are designed to support recovery of listed species or to restore populations to vacant habitat. Supplementation programs are designed to boost depleted populations. The role of conservation programs ranges from supplementing depressed natural populations to programs designed to recover imperiled populations to maintaining refugial populations or genetic material for populations facing extinction. In some cases, mitigation programs are used for conservation goals.

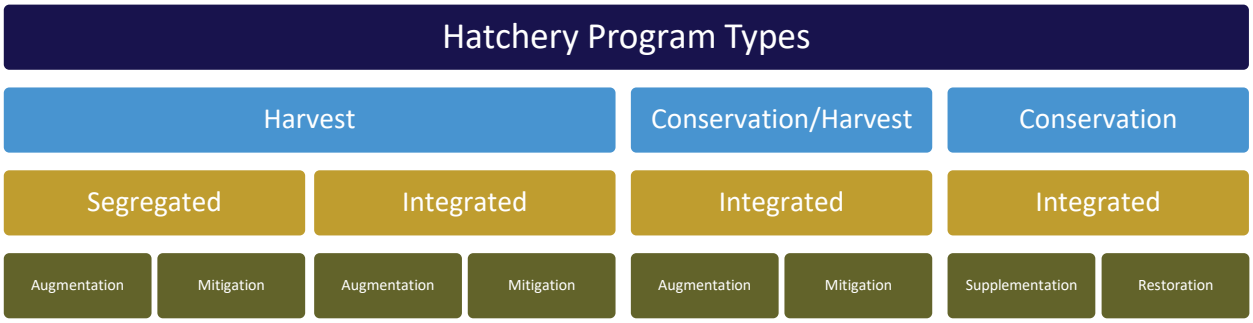

Figure 1. Hierarchy of hatchery program types

Harvest programs exceed all other classes of programs combined, comprising over 73% of hatchery production. Conservations programs comprise about 9% and conservation/harvest programs comprise over 16% of production (Table 2). In addition, there are 36 STEP programs that release over 3.4 million fish to State waters (Table 3). The STEP program also provides approximately 130,000 eggs to over 660 schools for the Egg-to-Fry educational program.

Table 2. Oregon Hatchery Program Summary[1]

Program Class	Number of Programs	Total Release Target
Conservation	13	3,799,000
Conservation/Harvest	13	6,903,750
Mitigation and Harvest Augmentation	75	30,338,760
Grand Total	101	41,041,510

Note:
1. Releases include some fish that are raised or acclimated at Salmon and Trout Enhancement Program (STEP) facilities. See Table 3.

Table 3. Summary of Salmon and Trout Enhancement Program Production

Watershed District	Education	Harvest/ Education	Harvest (Acclimation)[1]	Conservation (Acclimation)	Grand Total
Coos/Coquille	--	1,798,500	420,000	--	2,218,500
Deschutes	--	--	--	60,000[2]	60,000
Rogue	--	90,000	--	--	90,000
Mid-Coast	22,000	20,000	--	--	42,000
North Coast	52,200	200,000	40,000	--	292,200
North Willamette	--	--	375,000	--	375,000
Umpqua	--	245,000	--	--	245,000
Statewide Egg to Fry Program	130,000	--	--	--	130,000
Grand Total	**204,200**	**2,353,500**	**835,000**	**60,000**	**3,452,700**

Notes:
1. Release totals do not include all programs with STEP volunteer assistance at acclimation sites.
2. Releases are part of the Deschutes reintroduction programs above the Pelton/Round Butte Project.

Fish production targets and program types vary across the state. Most conservation fish production and conservation programs are located in the Deschutes, Grand Ronde, John Day, and North Willamette watershed districts. The Lower Columbia watershed district (harvest program) has substantially larger fish releases than the other watershed districts, and conservation/harvest programs are most numerous and release the most fish in the John Day and South Willamette watershed districts (Table 4; Table 5). The STEP program releases are concentrated in the Coos/Coquille, North Coast, North Willamette, and Umpqua watershed districts.

Table 4. Summary of fish production targets by hatchery program type in each watershed district

Watershed District	Program Type			Grand Total
	Conservation	Conservation/Harvest	Harvest	
Deschutes	1,929,000	250,000	50,000	2,229,000
Grand Ronde	1,390,000	215,000	801,460	2,406,460
John Day	150,000	1,860,000	1,575,000	3,585,000
Lower Columbia	--	--	16,169,100	16,169,100
North Coast	--	--	2,414,350	2,414,350
North Willamette	300,000	--	2,187,000	2,487,000
Rogue	--	--	3,032,250	3,032,250
South Willamette	--	4,578,750	547,500	5,126,250
Umpqua	30,000	--	3,562,100	3,592,100
Grand Total	3,799,000	6,903,750	30,338,760	41,041,510

Table 5. Summary hatchery program types in each watershed district

Watershed District	Program Type			Grand Total
	Conservation	Conservation/Harvest	Harvest	
Deschutes	5	1	2	8
Grand Ronde	5	1	3	9
John Day	1	3	3	7
Lower Columbia	--	--	9	9
North Coast	--	--	21	21
North Willamette	1	--	7	8
Rogue	--	--	14	14
South Willamette	--	8	2	10
Umpqua	1	--	14	15
Grand Total	13	13	75	101

4 Benefits of Hatchery Programs

Hatchery programs designed to augment or provide harvest opportunities have successfully supported commercial, tribal, and recreational fisheries (Heard 2001; Paquet et al. 2011; HSRG 2014). The majority (70% to 80%) of Pacific Northwest coastal fisheries are supported by hatchery programs (Trushenski et al. 2010). Hatchery-supported fisheries contribute to the economic (Naish et al. 2007) and cultural aspects of societies (Earth Economics 2021; HSRG 2014). Highland Economics (2022) estimated that the recreational fishery catch in Oregon comprises 68% hatchery salmon and steelhead and 70% hatchery trout. Similarly, the commercial catch of salmon in Oregon comprises 70% hatchery fish. Hatcheries also serve an educational role in communities and schools, providing opportunities to learn about fish populations, biology, and conservation (ODFW 2017). Hatchery programs play an important role in supplementing natural populations, reintroduction of species, and the conservation and recovery of imperiled populations (Naish et al. 2007; Paquet et al. 2011). Janowitz-Koch et al. (2017) found that a Chinook Salmon supplementation program provided a long-term demographic boost to the population. Hess et al. (2012) concluded that a Chinook Salmon supportive breeding hatchery program can successfully boost population size with minimal impacts on fitness of the wild population. Hatchery programs implementing HSRG hatchery management principles in the Columbia River basin improved the conservation status of steelhead, Chinook Salmon, and Coho Salmon populations while providing increased harvest (Paquet et al. 2011). Nuetzel et al. (2023) conducted research suggesting that reintroduction of Spring Chinook Salmon to Lookingglass Creek, Oregon, using juveniles from hatchery captive broodstock had the adaptive capacity to contribute to recovery goals. For threatened and endangered stocks, hatchery programs offer pathways to demographically support the populations and to conserve genetic diversity (Naish et al. 2007).

5 Risks of Hatchery Programs

All hatchery programs potentially impose risks on natural populations. The type and level of risk can vary with the type of program and the status of the natural population(s) it interacts with. The ESA listing of threatened and endangered Pacific salmon and steelhead species in the 1990s through present coincided with research and concerns related to the effects of hatchery programs on West Coast salmon and steelhead natural populations. In a recent review of over 200 peer-reviewed publications on the effects of hatchery programs on wild fish, McMillan et al. (2023) found that production programs (synonymous with harvest programs) and production-supplementation programs (roughly synonymous with conservation-harvest programs) carried the greatest adverse effects (75% and 74% of publications reviewed, respectively) and had no beneficial effects (0% of publications reviewed). Recovery programs (roughly synonymous with conservation programs) had the lowest adverse effects (4% of publications reviewed) and the greatest beneficial effects (29% of publications reviewed).

The greatest risk concerns have centered around genetic issues related to relative reproductive success, survival, and phenotypic characteristics of hatchery and wild fish in natural environments (Kostow 2009). Much of the management focus has been on attempting to operate hatchery program that are genetically isolated from natural populations (segregated programs) and programs that intentionally integrate natural-origin fish in the broodstock to foster gene flow between the hatchery and natural populations to minimize divergence (integrated programs). Harvest programs are often segregated programs while conservation programs are typically integrated. These two management strategies carry varying risks for the native populations.

Fish propagated in a hatchery tend to become adapted to the hatchery environment. This process, known as domestication selection, poses a risk to wild populations when there is introgression between hatchery and wild fish (Busack and Currens 1995; Howe et al. 2024). Genetic risks to wild populations include direct genetic effects and indirect genetic effects. Direct genetic effects occur when hatchery fish hybridize with wild fish, potentially leading to loss of interpopulation genetic diversity and outbreeding depression (Waples 1991). Loss of genetic diversity may occur when locally adapted populations become more homogenized due to the presence of hatchery fish, particularly if hatchery fish are not derived from local broodstock or are present on spawning grounds due to straying. Outbreeding depression is a loss of fitness in offspring that may occur when hybrids are produced from stocks with genetic incompatibility, such as may occur when a hatchery stock that has diverged from the natural population spawns with wild fish.

Indirect genetic effects include reduced population size and low effective population size (Waples 1991). Reduction in the wild population size, which may occur through mechanisms of interaction with hatchery fish such as loss of diversity and outbreeding depression, as well as ecological effects such as competition, predation by hatchery fish, disease, and shifts in natural predator abundance. Reduction in population size may also occur when mixed stock fisheries comprising hatchery and wild fish results in serious declines in the less abundant wild stock. Reduced abundance can have an indirect effect on genetic population structure and selection regimes, potentially causing directional genetic changes in wild populations (Waples 1991). Populations with low effective population size (a genetic concept approximately related to the number of individuals that reproduce per generation) can result in a loss of genetic variability, limiting the evolutionary potential of the population to adapt to changing conditions

and compromising its long-term ability to survive. Low effective population size can also lead to inbreeding depression that can result in loss of fitness (Waples 1991).

Ecological risks occur when hatchery fish detrimentally interact with natural-origin fish in the natural environment. This is often related to the size of the program and physical and behavioral differences between hatchery and wild fish. Productivity of wild populations may be significantly reduced by hatchery programs, even when there are no genetic risks (Kostow 2003, 2009). Other processes related to hatchery programs that pose risk to native populations include disease effects, fisheries effects, epigenetic effects, and hatchery effects on the ocean (McMillen et al. 2023). Hatchery strategies have been developed and implemented to decrease these risks, such as incorporating local-origin, wild fish in broodstock, increasing phenotype similarity between hatchery and wild fish, or segregating hatchery and wild fish.

Ecological implications have received less emphasis than genetic implications in risk analyses of hatchery programs (Kostow 2009). Management strategies designed to reduce genetic risks may sometimes, paradoxically, increase ecological risks, such as the use of local broodstock, high proportions of wild fish in broodstock, and increased reproductive success of hatchery fish (Kostow 2009). Kostow (2009) identified the following factors that contribute to the ecological risk of hatchery programs:

- **Large releases of hatchery fish**: Large scale releases of hatchery fish can magnify even relatively small ecological interactions. Large release numbers coupled with habitat degradation or loss and high harvest rates may interact to affect wild populations. Although large releases of hatchery fish may also have genetic implications, ecological risks can operate without genetic interactions.
- **Density-dependent mortality increased by hatchery fish**: Density dependence affects survival relative to the abundance of juvenile salmonids. At low densities, survival increases. Survival decreases as populations increase, and ultimately, density dependence limits survival when the population approaches carrying capacity. Such effects may occur in freshwater or marine environments. When large numbers of hatchery fish are present, wild populations can experience density dependent growth or survival as if the wild population is much larger than it actually is, decreasing the productivity of the wild population.
- **Hatchery fish do not emigrate after release**: Hatcheries may release fish prior to the smolt stage (the life stage that emigrates to the marine environment) intentionally, such as fry, parr, or pre-smolts. In addition, some hatchery programs may, unintentionally, produce fish that residualize in the freshwater environment despite being part of a smolt-release hatchery strategy. In general, the more time spent in freshwater by anadromous hatchery fish, the greater the opportunity for and effect of ecological interactions with wild fish, such as density dependent decreased growth and survival, competition for food and territories, predation, and disease transmission.
- **Physical difference between hatchery and wild fish**: To increase their survival, hatchery fish are often grown to a larger size at release than their wild conspecifics. This size advantage may infer a competitive advantage over wild fish and increase their ability as predators. Hatchery fish may also demonstrate more aggressive behavior than wild fish, conveying a competitive advantage to hatchery fish. Spawn timing may differ between hatchery and wild fish. Earlier spawning fish are likely to have offspring that emerge earlier than later spawning fish. These offspring would

have the opportunity to establish prior residence over later emerging fish, and they would be bigger due to the additional time for growth. Both of these characteristics are strong determinants of success in competitive interactions (Rhodes and Quinn 1998).

If hatchery fish spawn later than wild fish, they may disturb the wild fish redds, reducing the reproductive success of the wild fish. Return and spawn timing has been shifted inadvertently by some hatchery programs. Selecting fish to shift hatchery run and spawn timing has also been used as a management strategy. It has been used to temporally isolate hatchery and wild spawners to minimize introgression or to enhance fishing opportunities by increasing the time when fish are available to catch.

- **Fish Health:** Hatcheries may amplify pathogens and/or introduce novel pathogens. These pathogens may be transmitted to fish in the natural environment, putting native populations at risk. The effluent from hatcheries, high density of fish in hatchery fish culture systems, and large numbers of fish released all may contribute to increase the risk of transmitting pathogens to natural populations. Hatcheries may acquire novel pathogens, putting the hatchery program(s) and native species at risk. Recently, a novel *Myxidium* parasite was discovered at three ODFW trout hatcheries. The outbreak was contained by following biosecurity measures and disposing of the fish in infected raceways. However, this event illustrates the potential risk of disease in fish hatcheries and the importance of biosecurity protocols and the fish health staff (ODFW 2024c)
- **Environmental effects**: Potential environmental effects of hatcheries include diminished water quality through discharge of effluent containing suspended solids, chemicals, or water temperature that differs from the natural environment. Discharge from hatcheries may result in eutrophication, toxic chemicals in the natural environment, or undesirable changes in water temperature in the natural environment. Native fish may be entrained in hatchery intakes or outfalls (ODFW 2010). Outfalls may cause false attraction, where fish are attracted to the outfall due to flow, odor, or water temperature. This may cause undesirable changes in fish behavior.

6 Strategies to Reduce the Risks of Hatchery Programs

Numerous management strategies have been developed and employed to attempt to reduce the genetic and ecological risks of operating hatchery programs to wild populations. For conservation programs, genetic effects may be addressed by using native broodstock (of the target population), incorporating wild fish in the broodstock (integrated program; HSRG 2004, 2009), attempting to maintain a sufficiently large effective population size to avoid deleterious genetic drift (Busack and Currens 1995), and limiting the proportion of hatchery-origin adults on the spawning grounds (HSRG 2004, 2009). In some intensive conservation programs, genetic methods are used to identify broodstock of the correct stock to avoid inadvertently incorporating fish from other populations (Busack and Currents 1995) and are used to develop estimates of relatedness among the broodstock to optimize spawning crosses to avoid inbreeding.

Segregated harvest programs address genetic effects by using only hatchery-origin fish for broodstock. The returning fish are subject to fisheries, and the programs are normally designed to return fish to a terminal location (such as a hatchery fishways/trap) so they can be removed, minimizing the number of hatchery fish that can reproduce with wild fish in nature. These harvest program management strategies contribute to fisheries while decreasing the number of returning adult hatchery fish that escape to the natural spawning grounds. For all hatchery programs it is recommended to mark 100% of the fish and release fish in locations where they can be managed as returning adults to limit the number on the spawning grounds (HSRG 2004, 2009).

Ecological effects (HSRG 2004, 2009; Kostow 2009) may be addressed by releasing smaller numbers of hatchery fish, releasing numbers of hatchery fish within the carrying capacity of the system (HSRG 2004, 2009; Kostow 2009), releasing hatchery fish of similar size to wild fish (Rhodes and Quinn 1999), limiting the total number of hatchery fish released at a regional scale, releasing only actively migrating smolts, locating release locations away from sensitive habitat, using acclimation sites to influence homing to desired reaches, operating hatchery programs to synchronize return migration and spawning timing with wild fish, restricting the number (proportion) of hatchery fish spawning in reaches with wild fish (HSRG 2004, 2009), marking 100% of the hatchery fish to facilitate mark-selective fisheries, and identifying hatchery fish for management activities such as broodstock collection and sampling and for monitoring and evaluation and research (HSRG 2004, 2009; Kostow 2009).

Environmental effects can be addressed by operational improvements and/or facility improvements. Effluent should be treated in treatment ponds and/or by filtering to remove solids and chemicals to meet water quality standards. Water temperature issues, normally caused by discharging water that has warmed in relation to water in the natural environment, should be monitored. Operational changes may alleviate this issue. More problematic water temperature challenges could require re-design of the water system, treatment system, or rearing environment in the hatchery to reduce unwanted temperature differences in the discharge water. Entrainment of fish at water intakes or outfalls is addressed by properly screening intakes and outfalls to prevent fish from entering. False attraction, where fish are attracted by flow, odors, or desirable water temperature from outfalls, is not easily remedied without re-directing the discharge to another location. Many hatcheries have non-consumptive water rights requiring that water be returned to the river. This requirement may make it more difficult to address false attraction issues.

6.1 Policy Documents

Hatchery programs are operated to provide conservation and fisheries benefits. However, the operation of hatchery programs also carries risks to native species and the natural environment. The overarching goal of a hatchery program is to achieve programmatic benefits while minimizing these risks. ODFW implements and complies with hatchery conservation and management strategies and policies and plans to minimize impacts of hatchery programs on wild fish. These documents include the Native Fish Conservation Policy (ODFW 2002), Fish Hatchery Management Policy (FHMP; ODFW 2010), Fish Health Management Policy (ODFW 2003), hatchery program management plans (ODFW 2024d), and the conservation plans for the State of Oregon. These policies and plans provide guidelines for the management of wild and hatchery fish in Oregon. In addition, consultations under ESA typically result in terms and conditions and reasonable and prudent measures in biological opinions and permits. ESA recovery plans for listed species may dictate how hatchery programs integrate with overall recovery strategies and actions.

6.1.1 The Native Fish Conservation Policy

The 2002 Native Fish Conservation Policy is in place to ensure the conservation and recovery of native fish in Oregon (ODFW 2002; revised 2003). This policy's main focus is conserving naturally produced native fish, which is a result of the ESA delisting decision criteria and the foundation of long-term sustainability of native species and hatchery programs alike (ODFW 2002). This policy provides the basis for management of hatcheries, fisheries, habitat, predators, competitors, and pathogens as they relate to the sustainable production of naturally produced native fish. The policy has three areas of emphasis: (1) the defensive conservation approach to ensure the avoidance of serious depletion of native fish; (2) the proactive conservation approach to restore and maintain native fish at levels providing ecological and societal benefits; and (3) consistent with native fish conservation, ensure that opportunities for fisheries and other societal resource uses are not unnecessarily constrained (ODFW 2002).

The policy lists three conservation goals:

1. Prevent the serious depletion of any native fish species by protecting natural ecological communities, conserving genetic resources, managing consumptive and nonconsumptive fisheries, and using hatcheries responsibly so that naturally produced native fish are sustainable.
2. Maintain and restore naturally produced native fish species, taking full advantage of the productive capacity of natural habitats, in order to provide substantial ecological, economic, and cultural benefits to the citizens of Oregon.
3. Foster and sustain opportunities for sport, commercial, and tribal fishers consistent with the conservation of naturally produced native fish and responsible use of hatcheries.

The policy outlines a number of key elements, including the following:

- Naturally produced fish are foundational for the long-term sustainability of native fish species in all geographic regions of the State. The ODFW shall manage native fish to maintain and restore naturally reproducing native fish species, provide recreational commercial, cultural, and aesthetic benefits of optimum native fish populations to present and future citizens, and contribute benefits to their ecosystems.

- Hatcheries shall be used responsibly to meet the goals of this policy. ODFW shall weigh options for conservation actions to restore naturally producing native fish such that the management actions address and help remedy the primary factors of decline, consider economic effects, and consider the potential for success.
- Native fish shall be managed at the species management level and incorporate population structure within species management units and base sustainability standards on biological attributes related to species performance.
- Fisheries management shall use precautionary strategies when faced with scientific uncertainty but may keep biological risks within acceptable limits using monitoring and evaluation with responsive management, and also implement research to address uncertainties.
- Non-native fish and hatchery-based fisheries shall be managed to optimize fisheries consistent with the conservation of naturally produced species.

The success of the Native Fish Conservation Policy largely depends on conservation plans that are developed for locally-adapted individual species management units. The plans will be implemented incrementally depending on availability of funding and prioritization by ODFW, which are affected by tribal governments, management partners, and the public (ODFW 2002). Once developed, the State will continue to maintain these plans.

The policy includes implementing conservation plans that include a range of options for recovery strategies, fisheries, and the responsible use of hatchery fish, such as is prescribed in the state conservation plans and the National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries) recovery plans. The highest priority shall be placed on management units that contain fish listed under the federal or state ESAs, contain state-sensitive species, or contain native fish populations exhibiting continued decline or risk of extirpation. Management units that have new hatchery programs or programs in need of substantial change are also emphasized in the policy.

Other items described in the policy include education and training requirements related to the Policy for ODFW staff, Commissioners, and management partners and interim criteria for management unit status and performance to ensure conservation of native fish. The policy also describes how to implement the criteria to classify a management unit as “at risk” (ODFW 2002). This policy is used to identify and prioritize native populations for conservation measures and to provide operational protocols for hatcheries to minimize the effects of their programs on naturally producing native fish populations and species.

6.1.2 Fish Hatchery Management Policy

The 2010 FHMP is currently used for ODFW hatchery operations and describes hatcheries as a tool for management and conservation of fisheries and the range of possible applications of this policy (ODFW 2010). This document provides general guidelines and measures for fish culture programs regarding genetic resources of native fish populations spawned or reared within hatcheries. The FHMP also describes best management practices that ensure conservation of both hatchery- and natural-origin fish, which are important to maintaining fisheries opportunities and for the natural production of native fish (ODFW 2010).

The goals of the FHMP include fostering and sustaining fishing opportunities while maintaining conservation priorities for naturally reproducing native fish populations, contributing to the

sustainability of naturally reproducing native fish populations, maintaining genetic integrity and resources of native fish populations that are spawned or reared in captivity, and minimizing adverse ecological impacts to watersheds (ODFW 2010). Operating principles identified by the FHMP include removing as many random mortality effects as possible without influencing native fish life or experience in their habitats. This operating principle is dependent upon funding, program type, facility, and operational flexibility. The policy requires that hatchery program management plans (HPMPs) shall be developed and implemented in consultation and coordination with management partners and the public, in coordination with native fish conservation plans. Other operating principles include managing hatchery programs to provide optimum fishery opportunities and conservation benefits, maximizing the quality of fish produced at state hatcheries, and using monitoring and evaluation protocols to assess and achieve program objectives (ODFW 2010).

The FHMP provides a comprehensive policy for the planning and coordination of management objectives, the identification and development of hatchery program objectives, fish culture operational guidelines, facility operational guidelines, monitoring and evaluation goals, record keeping, and staff training requirements (ODFW 2010). The FHMP is a centralized source for general information about hatchery management but does not provide exhaustive detail for each point and should be used with other regulatory literature.

6.1.3 Hatchery Program Management Plans

The 2010 FHMP dictates that hatchery management plans shall be developed following the objectives and guidelines in the FHMP. There have been 33 HPMPs developed for hatchery facilities operated by ODFW that detail hatchery facilities, program design, and operational parameters following the FHMP guidelines (ODFW 2024d). These HPMPs provide descriptions of the facilities and staffing, descriptions and goals of the programs, and detail how the programs are designed and managed to meet the following objectives of the FHMP:

- Foster and sustain opportunities for sport, commercial, and tribal fishers consistent with the conservation of naturally produced native fish.
- Contribute toward the sustainability of naturally-produced native fish populations through the responsible use of hatcheries and hatchery-produced fish.
- Maintain genetic resources of native fish populations spawned or reared in captivity.
- Restrict the introduction, amplification, or dissemination of disease agents in hatchery-produced fish and in natural environments by controlling egg and fish movements and by prescribing a variety of preventative, therapeutic, and disinfecting strategies to control the spread of disease agents in fish populations in the state.
- Minimize adverse ecological impacts to watersheds caused by hatchery facilities and operations.
- Communicate effectively with other fish producers, managers, and the public.

6.1.4 Fish Health Management Policy

Published in 2003, the ODFW Fish Health Management Policy describes measures that minimize the impact of fish diseases on Oregon's fish resources (ODFW 2003). This document applies to all ODFW hatchery operations including STEP, fish propagation projects, cooperative salmon hatchery programs, and the non-departmental import, transport, release, or rearing of non-aquaria species (ODFW 2003). It is ODFW's responsibility to restrict the introduction, amplification, and dissemination of disease agents

in hatchery-origin fish and in natural environments (ODFW 2003). This is accomplished through controlling the transfer of fish and eggs among hatchery facilities and to the natural environment, applying preventative measures and treatments, using therapeutics, and following disinfecting strategies. Further, the objectives of the Fish Health Management Policy are achieved through inspecting and detecting disease agents in fish from both fish hatcheries and natural environments while also requiring the containment and treatment of disease agents (ODFW 2003).

Defined within the policy are Category I through Category IV (ranked from most to least serious) fish diseases and pathogens (ODFW 2003). These category definitions briefly cover the types of pathogens and a non-exhaustive list of diseases within each category. Criteria for importing, exporting, or transferring fish, as it relates to fish health and the transmission of pathogens, is also covered within the document (ODFW 2003). The Fish Health Management Policy lists additional resources for fish disease management, such as the American Fisheries Society Fish Health Blue Book[5], and other documents that may be used to support fish health efforts. Inspection and detection requirements for departmental and non-departmental fish culture programs are outlined. Containment and treatment of diseases and the requirements for using fish carcasses in stream enrichment projects are also defined. The policy is used as a guide to maintain fish health within hatchery settings and prevent negative fish health impacts to hatchery fish and natural-origin fish that may occur as a result of hatchery operations.

6.1.5 Conservation Plans for the State of Oregon and Endangered Species Act Recovery Plans

The Native Fish Conservation Policy (ODFW 2002) requires the development of conservation plans for locally-adapted individual fish species management units (ODFW 2024e). Each plan includes identification of a species management unit, description of the desired biological status of the unit, the unit's current status, short- and long-term strategies to conserve the unit, assessment of the primary factors causing the gap between the current and desired status, the monitoring and evaluation (or research) needed to gauge success of the plan, a process for modifying corrective strategies, measurable criteria, reporting requirements, and potential impacts to other native fish species (ODFW 2002). The conservation plans contain hatchery-related management actions including smolt release targets and targets/limits for the percentage of hatchery fish on the spawning grounds (pHOS).

Federal ESA recovery plans are non-regulatory documents that include the path and tasks required to restore and secure listed populations to become self-sustaining. Recovery plans are developed with federal, state, tribal, local governmental, nongovernmental, and other interested parties. Recovery plans are intended to result in a listed species being reclassified from endangered to threatened status or result in the delisting and removal of the species from ESA protections. Recovery plans include specific management actions necessary to achieve species recovery; objective, measurable criteria for delisting; and estimates of the time and costs required to achieve the plan's goal.

Table 6 lists the state and federal plans for species management units (SMUs), ESUs, and DPSs in Oregon.

[5] https://units.fisheries.org/fhs/fish-health-section-blue-book-2020/

Table 6. Conservation plans and federal recovery plans for species management units, evolutionarily significant units, and distinct population segments in Oregon

SMU, ESU, or DPS	Entity	Plan Name	Year
Coastal Chinook Salmon, Spring Chinook Salmon, Chum Salmon, Winter Steelhead, and Summer Steelhead SMUs	State	Coastal Multi-Species Conservation and Management Plan	2014
Lower Columbia River Coho, Lower Columbia River Chinook, Columbia River Chum ESUs, and Lower Columbia River Steelhead DPS	State/ Federal	Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead	2010
Mid-Columbia Steelhead DPS	State/ Federal	Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment	2010
Oregon Coast Coho ESU	State	Oregon Coast Coho Conservation Plan for the State of Oregon	2007
	Federal	Recovery Plan for Oregon Coast Coho Salmon Evolutionarily Significant Unit	2016
Rogue Fall Chinook Salmon SMU	State	Conservation Plan for Fall Chinook Salmon in the Rogue Species Management Unit	2013
Rogue Spring Chinook Salmon SMU	State	Rogue Spring Chinook Salmon Conservation Plan	2007
Southern Oregon/Northern California Coast Coho ESU; Rogue-South Coast Winter Steelhead SMU; Rogue Summer Steelhead SMU	State	The Rogue–South Coast Multi-Species Conservation and Management Plan	2021
Upper Willamette Spring Chinook ESU and Winter Steelhead DPS	State/ Federal	Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead	2011
Snake River Basin Fall Chinook DPS	Federal	ESA Recovery Plan for Snake River Fall Chinook Salmon (*Oncorhynchus tshawytscha*)	2017
Snake River Spring- and Summer-Run Chinook Salmon and Snake River Basin steelhead	Federal	ESA Recovery Plan for Snake River Spring/Summer Chinook Salmon (*Oncorhynchus tshawytscha*) & Snake River Basin Steelhead (*Oncorhynchus mykiss*)	2017
Southern Oregon/Northern California Coast ESU of Coho Salmon	Federal	Final Recovery Plan for the Southern Oregon/Northern California Coast Evolutionarily Significant Unit of Coho Salmon (*Oncorhynchus kisutch*)	2014
Coterminous United States Bull Trout DPS	Federal	Recovery Plan for the Coterminous United States Population of Bull Trout	2015
Lahontan Cutthroat Trout	Federal	Lahontan Cutthroat Trout (*Oncorhynchus clarkii henshawi*) Recovery Plan	1995
		Updated Goals and Objectives for the Conservation of Lahontan Cutthroat Trout (*Oncorhynchus clarkii henshawi*)	2019

6.2 Oregon Hatchery Research Center

The Oregon Hatchery Research Center (OHRC) is a cooperative research project between the ODFW and the Oregon State University Department of Fisheries, Wildlife, and Conservation Sciences. OHRC research is vital to the success and implementation of hatchery programs by informing hatchery management that better supports angler opportunity and wild fish conservation. The center is also

charged with helping Oregonians understand the role and performance of hatcheries in responsibly protecting Oregon's native fishes. The OHRC focuses on the following three areas of research:

1. Understand mechanisms that may create differences between hatchery and wild fish
2. Develop approaches to manage hatchery fish that conserve and protect native fish
3. Methods to increase imprinting and homing back to the hatchery

The research the OHRC conducts is published in peer-reviewed journals and is used to inform the management of hatchery program and wild fish population in Oregon.

6.3 Hatchery Practices to Limit Negative Effects of Hatcheries on Wild Fish

ODFW has developed specific objectives for hatchery programs to minimize negative effects on wild fish. In general, every hatchery program shall achieve the following goals:

1. Provide conservation and/or a fishery benefit.
2. Provide a net survival advantage (egg to adult) over naturally produced fish.
3. Have minimum adverse interactions of hatchery programs on native fish populations and watershed health such as competition, predation, genetic introgression, and disease amplification.
4. Have minimum adverse effects of hatchery programs on native fish populations and watershed health such as water quality and quantity, solid and chemicals waste, and fish passage.
5. Hatchery programs shall be sustainable over time.

The hatchery program objectives are detailed in the 33 Hatchery Program Management Plans and are summarized in Section 6.1.3. Hatchery programs are broadly categorized into two types: harvest and conservation.

Harvest programs operate to enhance or maintain fisheries without impairing naturally reproducing populations (Figure 2). Harvest programs are often segregated programs where only hatchery-origin fish are collected for broodstock and natural-origin fish are excluded. Alternatively, many harvest programs are integrated. These two strategies are both intended to reduce negative impacts on natural populations: segregated programs attempt to keep hatchery and natural origin fish separate by minimizing hatchery fish access to natural spawning areas, while integrated programs minimize the risk of domestication selection in the hatchery from affecting natural populations. Fish from hatchery harvest programs and naturally-produced native fish are managed separately in fisheries and on spawning grounds, as necessary for conservation. This may be accomplished by spatial and/or temporal segregation and also by marking hatchery fish so they can be identified by hatchery staff and biologists as well as by anglers and in harvest operations (i.e., mark-selective fisheries). There are two types of harvest programs:

1. Harvest augmentation programs, which are used to increase fishing and harvest opportunities where there is no mitigation program in place
2. Mitigation programs, which are used pursuant to an agreement to provide fishing and harvest opportunities lost as a result of habitat deterioration, destruction, or migration blockage

Harvest hatchery programs are managed to ensure risk to naturally produced native fish is within acceptable and clearly defined limits. Harvest programs may use only hatchery-origin fish for broodstock

from existing programs and manage for minimal spatial or temporal overlap between hatchery- and natural-origin fish in spawning areas. Alternatively, some harvest programs may incorporate broodstock derived from naturally-produced native fish or transition to naturally produce native fish for broodstock. These approaches will depend on which broodstock strategy will best meet the conservation objectives of the natural populations.

Conservation programs operate to maintain or increase the number of naturally-produced fish without reducing the productivity of naturally-reproducing populations (Figure 3). Conservation programs are designed to provide a survival advantage compared to survival in the natural environment with minimal impact on genetic, ecological, and behavioral characteristics of natural populations. Implementation of conservation programs shall include monitoring and evaluation to control risks and assess achievement of program goals. Once program goals of a conservation program are met, the program will be discontinued. There are numerous strategies cited in the FHMP (ODFW 2010) that can be used to develop and implement a conservation program. These include:

- Supplementation – a portion of an imperiled population is propagated in a hatchery to increase survival and provide a demographic boost to the population. In some cases, naturally produced native fish from outside the river basin may be used to supplement an imperiled population.
- Restoration – The best available, suitable non-local hatchery or natural-origin native broodstock are used to propagate and out-plant fish to establish a population in habitat that is vacant of that fish species.
- Captive broodstock – maintains a portion or all of an imperiled population in a protected hatchery environment for the entire life cycle to maximize survival and the number of progeny produced.
- Captive rearing – maintains a portion of an imperiled population in the hatchery environment for part of its life cycle that cannot be maintained in the wild.
- Egg banking – temporarily relocates a population from habitats that cannot sustain the population to another natural or artificial habitat that can support the population.
- Cryopreservation – freezes sperm from naturally produced native fish for later use in conservation.
- Experimental – investigates and resolves uncertainties relating to the use of hatcheries as a fish conservation tool.

Both conservation and harvest hatchery programs are managed to minimize negative effects on natural populations while achieving programmatic goals. These management strategies seek to minimize negative genetic consequences that may result from the hatchery programs through:

- Implementation of risk reduction strategies for identification of the source population for broodstock collection,
- Composition of hatchery and wild fish in the broodstock,
- Spawning matrix design,
- Minimization of domesticating selection in the hatchery environment,
- Reduction of straying of returning adults,
- Minimization of precocial maturation and residualism in the hatchery population,
- Control of the proportion of hatchery spawners on the natural spawning grounds, and
- Control of the spatial and temporal distribution of hatchery and wild spawners on the spawning grounds.

Behavioral and ecological effects are addressed by culturing fish to appropriate size and physiological readiness to minimize competition and predation, maximize migratory behavior, and manage the spatial distribution and proportion of hatchery to wild spawners in nature.

Genetic Effects – Broodstock and Spawning Strategies: Broodstock sources are chosen to meet programmatic goals. Harvest programs may use segregated broodstock composed entirely of hatchery-origin fish to maintain segregation between hatchery and wild populations and to avoid mining wild fish for broodstock. For conservation and some integrated harvest programs, ideally the broodstock source is the target conservation population. Imperiled populations may not be sufficiently large to safely collect broodstock to support a hatchery program. Depending upon relative risks and benefits, broodstock sources may be obtained from best donor population, hatchery or wild, to supplement an imperiled population or to reintroduce fish to vacant habitat. Conservation hatchery programs should be managed to achieve sufficient effective population size to minimize genetic drift. Spawning matrices can be employed to maximize effective population size in smaller programs. Harvest programs are generally large and are not at risk of genetic drift risks.

Genetic Effects – Gene Flow Management: The ratio of hatchery-origin to natural-origin fish in the broodstock should be designed to achieve conservation goals. Conservation programs typically use broodstock composed of 50% to 100% natural-origin fish to maintain desired gene flow between the natural and hatchery populations to prevent divergence. Broodstock should be collected throughout the temporal distribution of the run to avoid inadvertently shifting run and spawn timing. The age structure of fish selected for broodstock should generally reflect the natural population age structure. The proportion of hatchery fish on the spawning grounds (proportion of hatchery-origin spawners [pHOS]) should be managed to not exceed the target proportion. This allows demographic contribution of the hatchery fish to the natural population while minimizing the effects of hatchery gene flow to the natural population. The goal of managing the proportion of hatchery- and natural-origin fish in the broodstock and on the spawning grounds is to have a net geneflow where the natural-origin influence exceeds the hatchery-origin influence in the integrated hatchery and wild populations.

Genetic Effects – Intensive Hatchery Measures: More intensive measures to maintain the population and diversity may be employed when a population is imperiled and at risk of going extinct, such as captive broodstock, captive rearing, or egg banking programs. These types of program are not currently employed in Oregon.

Ecological Effects – Migratory Behavior: Hatchery fish are released to the natural environment, and for anadromous salmonids, are expected to migrate to the marine environment shortly after release. Hatchery programs have size targets at release for hatchery fish. These targets vary by species and life history types, but also may vary depending on empirical information for specific programs or similar program types. Juvenile fish that are too small may not be physiologically ready to smolt and may not migrate to sea and remain in the stream (residualize). Male fish that are too large at release or grew too quickly in the hatchery may sexually mature at an early age (precocity) and also residualize. Growth trajectory and ultimate size at release both affect the tendency to residualize or become precocial. Survival of juveniles migrating to sea is often positively associated with size at release, but size may also affect the rates of residualism and precocity, and the rate males return from sea as jacks. Juvenile hatchery fish that do not migrate to sea may compete with and prey upon threatened or endangered native fish in the freshwater environment. In addition to the potential negative ecological

consequences, the presence of precocial fish and residuals in hatchery populations concomitantly reduces the return of adult hatchery salmon from sea.

Genetic and Ecological Effects – Homing and Straying: The release location and the water upon which the fish have been reared will affect their homing (or straying) upon return from sea as adults. Anadromous salmonids imprint on water sources during freshwater rearing from larval stages through smolting (Keefer and Caudill 2014). Exposing juveniles to water that is not from the location where they are to return may result in excessive straying where hatchery fish return to locations that are undesirable, such as straying into another population or failing to home to critical reaches where managers are attempting to increase the population.

Genetic and Ecological Effects – Managing Hatchery Fish on the Spawning Grounds: Disposition of hatchery-origin adults that return to collection facilities, such as a hatchery fish ladder and trap, follows protocols outlined in the FHMP. The disposition depends in part on the type of program, harvest or conservation, the fish are from. Fish may be collected as broodstock, allowed to spawn in the natural environment, provided for tribal ceremonial and subsistence use, carcasses used for nutrient enhancement in streams, provide additional fishing opportunities, and other uses. Management of adult returns for harvest programs typically minimizes the number of hatchery fish in the natural spawning areas. Conservation programs strive to manage the proportions of hatchery and naturally produced fish in spawning areas. The proportions of natural and hatchery-origin fish in conservation program broodstock and on spawning grounds of population supplemented by conservation programs is designed to foster greater gene flow from the natural population than the hatchery population in the integrated natural-hatchery population to provide a survival advantage while minimizing negative effects on genetic, behavioral, and ecological characteristics of the target populations. In addition, management of hatchery spawners can reduce competition and redd superimposition on the spawning ground and subsequent density dependent effect on progeny.

Genetic and Ecological Effects – Implement Monitoring and Evaluation Program: Conservation programs implement monitoring and evaluation programs to assess progress toward meeting goals and control ecological and genetic risks. Conservation programs proceed with caution to avoid negative effects and optimize positive effects on the population. Success of conservation programs is tied to remediating the causes of the decline that necessitated the conservation hatchery program. When the goals of the conservation program are achieved, the program will be discontinued.

Monitoring and evaluation programs are used to gauge hatchery program success in meeting program and fish management objectives. Monitoring and evaluation programs can improve understanding of the reasons for success or failure, provide risk containment, and provide results to inform adaptive management programs. In order for monitoring and evaluation programs to function effectively, clear goals and objectives for management actions must be defined. Monitoring and evaluation programs should be designed to address the uncertainty of risks: programs with greater uncertainty will require more rigorous approaches. The monitoring and evaluation program shall use generally accepted scientific principles and measures to gather multi-generational information to evaluate hatchery programs relative to the measurable criteria that has been developed for each program. Each hatchery program management plan shall describe how the operations and objectives will be evaluated. Although monitoring and evaluation programs themselves carry some risk to natural populations through collecting and handling fish in the natural environment, they are a critical component of implementing

hatchery programs to avoid risks to natural population and improve the programs to achieve objectives and goals.

Fish Health: Hatchery programs have the potential to amplify infectious agents and introduce novel infectious agents to the natural environment, imposing risk to natural native populations. To minimize the probability of this happening, implementation of the hatchery programs and facility operations shall comply with fish health requirements as outlined in the Fish Health Management Policy (ODFW 2003). The policy requires the facility manager to ensure all fish stocks are inspected for a fish health examination a minimum of six weeks before release, transfer, or importation into the state. Regular monitoring must be performed by an ODFW fish health specialist, including screening for parasitic and bacterial agents, and viral examinations. Examinations for *Myxobolus cerebralis*, agent of whirling disease, must be conducted annually. The Facility Manager must direct the treatment or destruction of fish infected with any disease agent that may adversely affect the health of the fish of the State. When live fish have a disease agent, the ODFW shall follow the rules for containment of fish disease agents as described in the Fish Health Management Policy. The Policy describes preventative measures to reduce the probability of disease outbreaks and protocols for therapeutic treatments. The protocol also describes the fish health requirements for using carcasses or fish components for stream enrichment programs.

Environmental Effects: Hatchery facilities shall be designed and operated to minimize impacts to natural populations and their habitats. Water intakes and outfalls shall be screened to avoid entraining wild fish. Facilities that rear programs that can be a risk to endemic populations shall have outfalls double screened to prevent escapes. Hatcheries shall comply with legal obligations including water rights, water use reporting, chemical use and reporting, and fish passage. Water quality standards shall conform to the NPDES permits and reporting requirements. Operation of well-maintained hatchery facilities according to operational rules and regulations helps minimize the effects of hatcheries on the natural environment and native fish populations.

Accurate record keeping is vital for tracking hatchery operations and ensuring that programs are being operated and managed as designed, and that the facility is operating properly. Accurate records help ascertain reasons for problems and confirm successful implementation of programs.

Fish hatchery personnel are trained to assure awareness of and compliance with hatchery program management plans and continuing education on new scientific and technological developments. Hatchery personnel are critical to rearing healthy fish to program specifications and identifying potential problems, such as fish escapes or disease outbreaks. Well trained personnel ensure that hatchery programs and management plans are implemented as designed to reduce effects on natural populations.

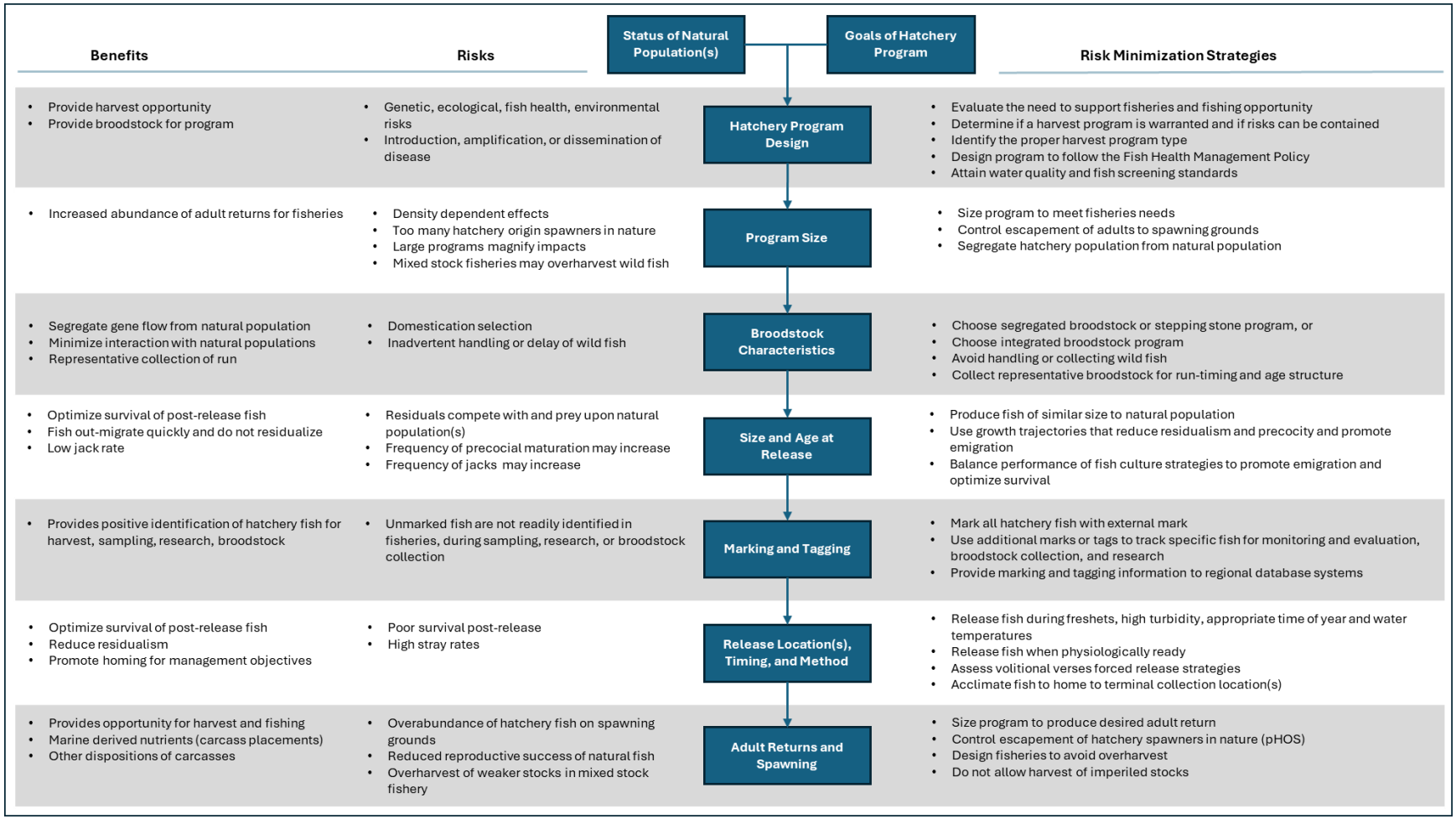

Figure 2. Hatchery harvest program conceptual model for limiting impacts to wild fish and achieving management goals

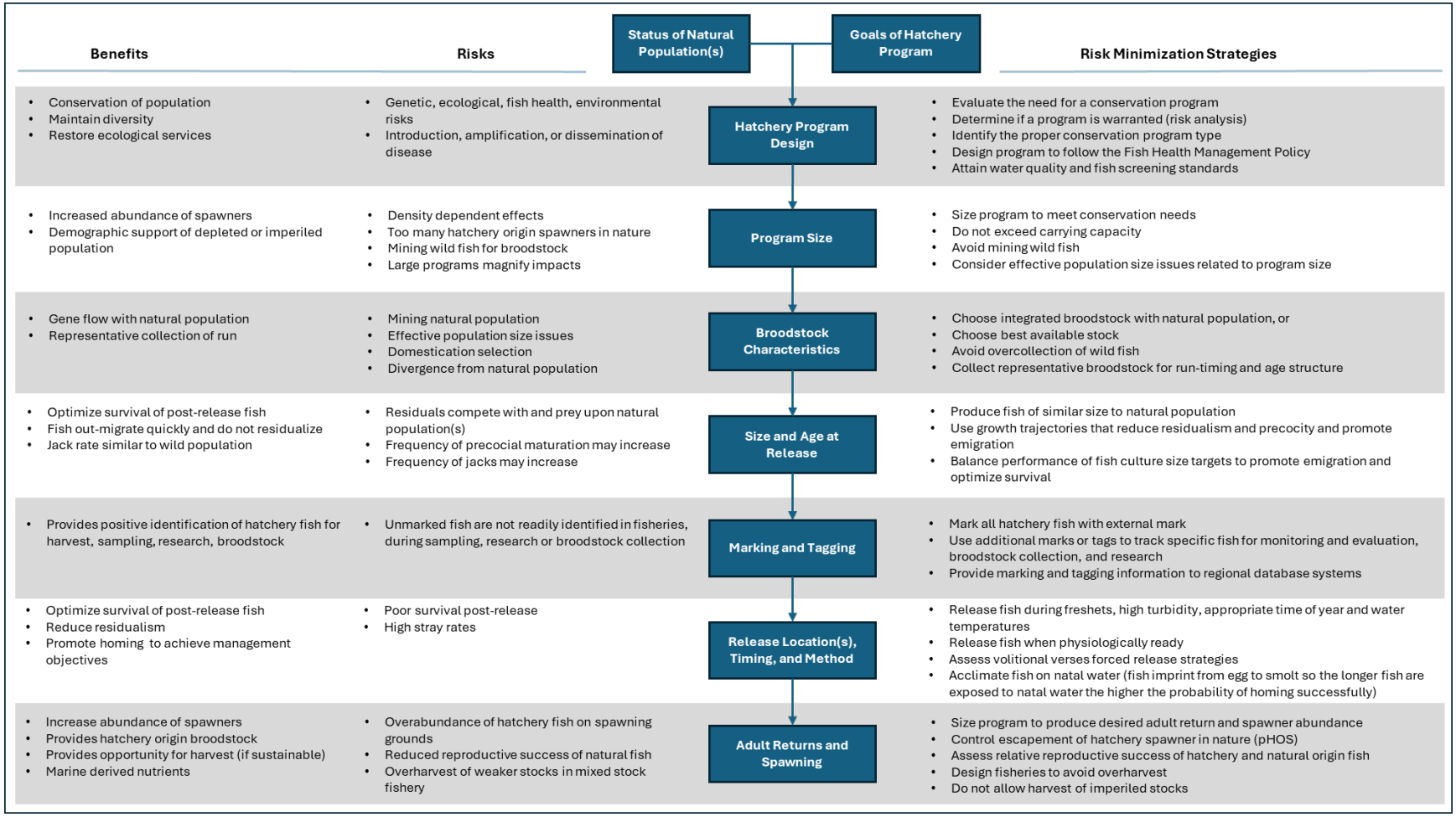

Figure 3. Hatchery conservation program conceptual model for limiting impacts to wild fish and achieving management goals

6.4 Hatchery and Genetic Management Plans

HGMPs are comprehensive plans describing all aspects of hatchery programs, facilities, and effects on natural populations. HGMPs are instruments used in federal ESA consultation that are used in place of a Biological Assessment (BA) for hatchery program consultations and are submitted to obtain authorization to operate hatchery programs under the ESA. ODFW has developed 77 HGMPs for Oregon hatchery facilities (Table 7) which contain the specific program objectives and provide detailed information on the operational guidelines and management strategies for each program to achieve the objectives and to maintain the genetic integrity of the natural populations and hatchery programs. HGMPs also include detailed information on the status of the affected populations, take of ESA-listed species, other species that may interact with program, details of the hatchery facilities and management of the program. The HGMPs also describe the monitoring and evaluation program and research programs, as applicable. HGMPs are specific to hatchery programs for different species and locations and provide a comprehensive description of the objectives, operational details, facilities detail, assessment detail, and information on the interaction of the program with other species or populations, particularly focusing on ESA-listed populations. HGMPs are the instrument used to enter the consultation process with NOAA Fisheries to obtain authorization to operate hatchery programs and ensure compliance with the ESA. Each HGMP section addresses specific information, actions, and activities for the proposed program. This information includes:

Section 1 provides the general program description, background information such as finding source, responsible organization or individuals, location of the program, goal of the program, program type, justification for the program, performance standards and indicators, expected size of the program, and watersheds targeted by the program, date program started or is intended to start, and current program performance.

Section 2 provides key information related to potential program effects on ESA-listed salmonid populations and the operation of fish propagation programs. It includes detailed descriptions of ESA-listed salmonid populations affected by the program and their status. This section also describes activities that may lead to take, estimates of annual take, and contingency plans if allowable take is exceeded.

Section 3 describes the hatchery program's alignment with ESU-wide hatchery plan or other regionally accepted policies, management plans, cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates. It describes fisheries that benefit from the program and indicates recent harvest levels and rates for program-origin fish. This section also describes species that could be negatively affected by the program, and species that could negatively affect the program.

Section 4 provides quantitative and narrative descriptions of the hatchery water source, and potential limitations to production related to the water source. It also describes measures that will be taken to avoid take of listed natural fish as a result of hatchery water withdrawal, screening of intakes or outfalls, or effluent discharge.

Section 5 provides comprehensive information of the hatchery facilities, including facilities or equipment for broodstock collection, fish transport, broodstock holding and spawning, incubation, rearing, acclimation and/or release. The section also describes past fish mortality events. The section describes

backup and risk aversion measures to minimize take of listed fish related to facility failure, water loss, disease, flooding, or other events.

Section 6 describes information on the broodstock-origin and identity. The section includes the number of natural-origin fish that will be collected for broodstock, levels of natural-origin fish in the broodstock, genetic or ecological differences between the proposed broodstock and natural stocks in the target area. The section describes risk aversion measures to minimize adverse genetic or ecological effects on natural-origin listed fish as a result of broodstock selection practices.

Section 7 describes collection of broodstock, the program broodstock goal, fish health procedures, and disposition of carcasses. The section also includes risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects on listed natural fish resulting from the broodstock collection program.

Section 8 describes fish mating procedures that will be used, including choice of spawners, fertilization protocols, cryopreservation of gametes (if applicable), and describes risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects on listed natural fish resulting from the mating scheme.

Section 9 describes incubation and rearing protocols, including life stage survivals, egg take, incubation procedures, ponding protocols, and fish health and monitoring procedure during incubation. Rearing protocols are described for ponding to release, including information on feed, rearing conditions, fish health monitoring, smolt development, and use of “natural” rearing methods (if applicable). The section includes risk aversion measures that will be applied to minimize the likelihood of adverse genetic and ecological effects on listed fish under propagation.

Section 10 describes the fish release levels, and release practices applied through the hatchery program, including proposed release numbers, locations, history of fish releases, dates of release, transportation (if applicable) and acclimation. The section also includes marking, disposition of surplus fish, pre-release fish health certification, and risk aversion measures to minimize the likelihood for adverse genetic and ecological effects on listed fish resulting from fish releases.

Section 11 describes the monitoring and evaluation plan performance indicators, including plans to collect data and staffing and logistical capacity to implement the monitoring and evaluation program. The section includes risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects on listed fish resulting from monitoring and evaluation activities.

Section 12 describes research programs conducted in direct association with the hatchery program described in this HGMP. The section also describes risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

Table 7. Summary of the number of Hatchery and Genetic Management Plans developed for ODFW operated hatchery programs by fish species

Watershed District	Chum Salmon	Coho Salmon	Fall Chinook Salmon	Rainbow Trout	Spring Chinook Salmon	Spring/Summer Chinook Salmon	Summer Steelhead	Winter Steelhead	Grand Total
Lower Columbia and Estuarine Area	--	3	3	--	1	--	--	--	7
Deschutes	--	--	--	--	2	--	1	1	4
Grand Ronde	--	--	--	--	--	5	2	--	7
John Day	--	1	1	--	1	--	1	--	4
North Willamette	1	1	--	--	2	--	2	2	8
South Willamette	--	--	--	1	4	--	1	--	6
North Coast	--	3	3	1	3	--	2	8	20
Rogue	--	1	3	--	1	--	1	3	9
Umpqua	--	2	3	1	1	--	1	4	12
Grand Total	**1**	**11**	**13**	**3**	**15**	**5**	**11**	**18**	**77**

7 Endangered Species Act Consultation Process

7.1 Hatchery Program Federal Consultation Process

The federal ESA provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The NOAA Fisheries Service (NOAA Fisheries; also known as the National Marine Fisheries Service or NMFS) is the lead federal agency for marine species, including the Pacific salmon and steelhead species and the U.S. Fish and Wildlife Service (USFWS) is the lead agency for species that do not live in marine environments (collectively, the “Services”). However, the delineation of some migratory species covered by the Services is not entirely obvious. The ESA requires federal agencies, in consultation with the USFWS and/or NOAA Fisheries, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. This process requires the services to obtain their own authorization under the ESA before approving a proposed hatchery program because authorization under ESA is a federal action. This typically results in a Biological Opinion and Incidental Take Statement to the federal agency from NOAA Fisheries and/or the USFWS. The Incidental Take Statement issued to NOAA Fisheries and/or the USFWS also covers the hatchery operator.

The ESA prohibits any action that causes a "take" of any listed species. In addition, import, export, interstate, and foreign commerce of listed species are all generally prohibited.

Two forms of take are defined in the ESA: Take (also known as direct take) and Incidental Take. Take means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Incidental Take is Take that is unintentional, but not unexpected. When a species is listed as endangered, take prohibitions are automatically extended to it under ESA Section 9. When a species is listed as threatened, the listing federal agency (NOAA Fisheries or USFWS) must issue protective regulations in order to extend any take prohibitions to the species under ESA Section 4(d).

The operation of fish hatcheries may interact with federally listed threatened or endangered species. Although fish hatchery programs are intended to provide conservation benefit, increase target fish populations, or increase fish abundance to support fisheries, the operation of such programs may cause direct or indirect take of federally listed species, particularly federally listed fish species such as Pacific salmon species, steelhead, or bull trout. The owners and/or operators of fish hatchery facilities must obtain coverage under the ESA to continue operations, or risk violating the ESA.

The operation of fish hatcheries may cause direct take of a species when a listed species is being propagated in the hatchery facility. Such programs are typically conservation hatchery programs designed to conserve and recover a listed species. Alternatively, indirect take may be caused by the operation of hatchery programs when the process of capturing broodstock or releasing juvenile fish causes take of a listed species that is not the subject of the hatchery program. For example, a program that rears and releases steelhead may incidentally take listed Chinook salmon during broodstock collection or when juveniles are released to the natural environment and prey upon or compete with the listed Chinook juveniles.

When ESA consultation is required, a Section 7 consultation is performed initially. There are several consultation avenues that are available to authorize an action under the ESA: Actions that result only in

indirect take are consulted on under Section 7. Actions that may result in indirect take of species listed as threatened may be authorized under the 4(d) rule. Actions that result in direct take of listed species or the incidental take of an ESA-listed species by a non-federal entity are authorized under Section 10. In special cases, an experimental population, often used for reintroduction of a species, may be authorized under Section 10(j). The authorization type applied to a consultation request depends upon the type of action that is proposed, how it might interact with ESA-listed populations, and the ESA status of the affected population (Figure 5).

7.2 Endangered Species Act Section 7 Consultations

NOAA Fisheries is the lead federal agency for ESA listings of Pacific salmon and steelhead species and performs consultations on these species. USFWS is the lead agency for resident species, such as Bull Trout and Lahontan Cutthroat Trout, and performs consultations on these species. Both Services may be involved in a consultation if an action affects species each agency is responsible for.

The Services uses Section 7 of the ESA to authorize hatchery and fishing actions that are funded, authorized, or carried out by a federal agency. Under Section 7 of the Endangered Species Act, federal agencies must consult with NOAA Fisheries or USFWS when any action the agency carries out, funds, or authorizes may affect species listed as threatened or endangered under the ESA, or any critical habitat designated for it. The Section 7 consultation process follows several steps to determine if a consultation is needed, and if a required consultation can be address through the informal or formal processes (Figure 4). Under Section 7, the Services can authorize take that is incidental to the operation of a hatchery program or to the conduct of a fishery.

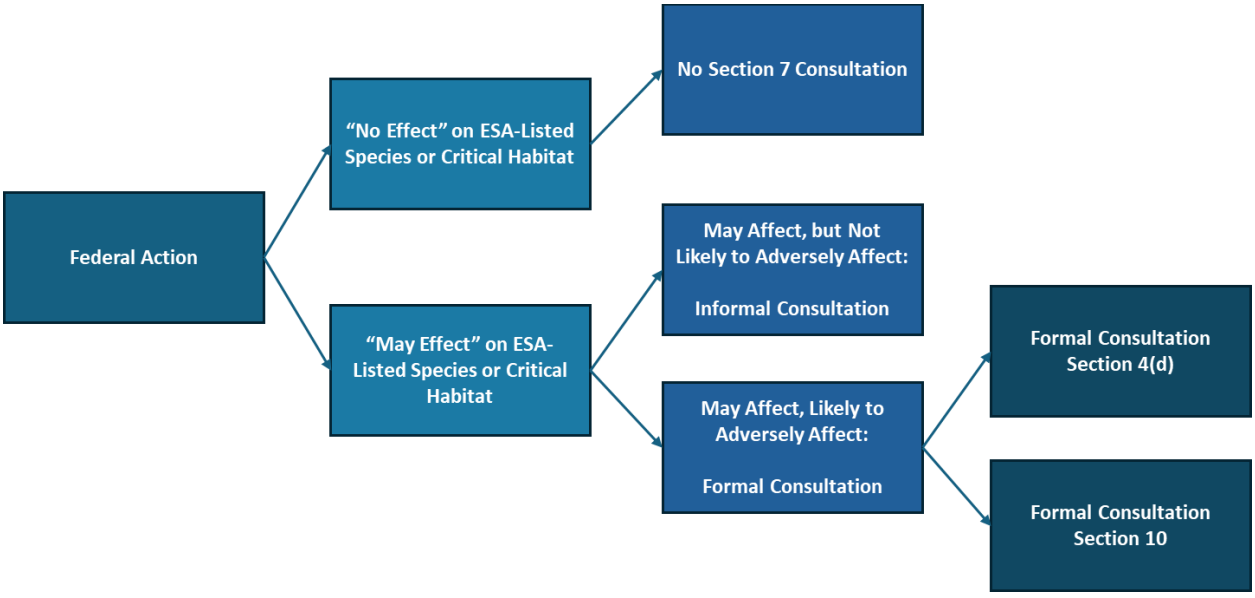

Figure 4. Initial steps required to determine if an Endangered Species Act consultation is required and the level of consultation required for a proposed action

7.2.1 No effect determination

Prior to entering into Section 7 consultation, a federal agency makes a determination that an action does or does not affect all listed species and critical habitat in the action area. If the determination finds

that there is no effect, no Section 7 consultation is required and the agency documents the "No Effect" determination in order to explain why section 7 consultation is not necessary.

7.2.2 Informal Consultation

Informal consultation may be used when a federal action agency determines that the action is Not Likely to Adversely Affect (NLAA) listed species and/or critical habitat. When a federal agency makes this determination regarding the proposed action, they submit an informal consultation request to NOAA Fisheries or USFWS. The NLAA determination is made when effects on ESA listed species and/or critical habitat are expected to be extremely unlikely to occur, are so small they cannot be meaningfully measured, detected, or evaluated, or all effects benefit the species and/or critical habitat. NOAA Fisheries or USFWS will provide a letter of concurrence or non-concurrence to the action agency once they receive enough information to make a determination. Issuance of the concurrence letter terminates the consultation process and no further consultation is necessary.

7.2.3 Formal Consultation

If an informal consultation does not result in a "Not Likely to Adversely Affect" (NLAA) determination because adverse effects to listed species are expected, the action agency must request formal consultation. NOAA Fisheries must comply with the NEPA when issuing an Incidental Take Statement. To initiate formal consultation, the action agency must provide information that is typically assembled by the action agency in a BA. However, for hatchery actions, NOAA Fisheries has developed the HGMP template, used in place of a BA, that encompasses the information normally included in a BA in a comprehensive format suitable for conveying information on hatchery program and facilities.

The HGMP is submitted to NOAA Fisheries with a letter making a "Likely to Adversely Affect" determination to request formal consultation. NOAA Fisheries reviews the consultation request, requests more information if needed, and once all the information necessary to initiate formal consultation is acquired, sends a letter of sufficiency to the applicant.

As part of the consultation process, an effects analysis is performed whereby NOAA Fisheries applies the best available scientific information, identifies the types of circumstances and conditions that are unique to individual hatchery programs, then refines the range in effects for a specific hatchery program. The analysis of a Proposed Action addresses six factors:

1. The hatchery program does or does not remove fish from the natural population and use them for hatchery broodstock
2. Potential hatchery fish and the progeny of naturally spawning hatchery fish on spawning grounds and encounters with natural-origin and hatchery fish at adult collection facilities
3. Potential interactions of hatchery fish and the progeny of naturally spawning hatchery fish in juvenile rearing areas, the migration corridor, estuary, and ocean,
4. Research, Monitoring, and Evaluation (RM&E) that exists because of the hatchery program
5. Operation, maintenance, and construction of hatchery facilities that exist because of the hatchery program
6. Fisheries that would not exist but for the hatchery program, including terminal fisheries intended to reduce the escapement of hatchery-origin fish to spawning grounds.

NOAA Fisheries (or USFWS) then drafts a Biological Opinion (BiOp) based on the effects analysis that typically includes an incidental take statement. Following consultation, a BiOp and an incidental take statement authorizing the incidental take (if appropriate) are issued to the federal agency. The intent of a BiOp is to ensure that the proposed project or action will not reduce the likelihood of survival and recovery of an ESA-listed species. A BiOp typically includes conservation recommendations that further the recovery of ESA-listed species. The biological opinion includes reasonable and prudent measures as needed to minimize any harmful effects and may require monitoring and reporting to ensure that the project or action is implemented as described. ESA Section 7 requires the Services to complete the formal consultation within 135 days of receiving all necessary information to conduct the consultation. This timeline can be extended if both agencies agree more time is needed, and in practice this is often the case.

7.2.4 Reinitiated Consultation

Sometimes after completion of consultation, the action changes, a new species is listed, or critical habitat is designated or revised while the action is ongoing. Take may occur when not exempted or other relevant new information becomes available. These scenarios may result in the need to revise the effects analysis in the Biological Opinion or in an informal consultation letter. Reinitiation of consultation is required and shall be requested by the action agency or by NOAA-Fisheries or USFWS. Conditions when consultation may be reinitiated include:

1. If the amount or extent of taking specified in the incidental take statement is exceeded
2. If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered
3. If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence
4. If a new species is listed or critical habitat designated that may be affected by the identified action.

Reinitiation is not always required if the conditions change; the changes need to result in the level and/or type of effects to exceed the level and/or type of effects that have previously been considered in the consultation. If reinitiation is necessary, the action agency must follow a similar process as used in informal and/or formal consultation.

7.2.5 Programmatic Consultation

A programmatic consultation addresses an agency's multiple actions on a program, region or other basis. A programmatic approach streamlines the consultations for broad agency programs or multiple similar, frequently occurring, or routine actions with predictable effects on listed species and/or critical habitat, thus reducing the amount of time spent on individual project-by-project consultations. However, hatchery programs are not generally suitable for programmatic consultation because each hatchery program and setting contains unique combinations of hatchery program types for various species and potentially various listed species that may be affected.

7.2.6 Emergency Consultation

The Endangered Species Act recognizes the need to respond immediately to emergencies. An emergency is a situation involving an act of God, disasters, casualties, national defense or security emergencies, etc., and includes response activities that must be taken to prevent imminent loss of human life or property. Where emergency actions are required that may affect listed species and/or their critical habitats, an action agency may not have the time for the administrative work required by normal consultation procedures under non-emergency conditions. NOAA Fisheries or USFWS will expeditiously process emergency consultations so Federal agencies can complete their critical missions in a timely manner while still providing the protections afforded to listed species and critical habitat under the ESA.

7.3 Endangered Species Act Permits and Authorizations on the West Coast Sections 4(d) and 10(a) of the Endangered Species Act

The Services issue permits and authorizations under sections 4(d) and 10(a) of the ESA for direct and incidental take of listed species in Oregon under carefully defined circumstances and as long as such take will not jeopardize the continued existence of the species or adversely modify its critical habitat. Federal actions, such as ESA Section 4(d) authorizations or ESA Section 10 permits, may require additional analysis under the National Environmental Policy Act (NEPA).

7.3.1 Endangered Species Act Section 10 Authorization

Direct take of listed species, whether listed as threatened or endangered, may be authorized under Section 10(a)(1)(A) of the ESA. Direct take is only permissible for scientific purposes or if used to enhance the propagation or survival of listed species. Hatchery programs that propagate listed species for conservation are authorized under Section 10 10(a)(1)(A).

Section 10(a)(1)(B) may authorize indirect take of a listed species by a non-federal entity. Hatchery programs operated by a non-federal entity that do not rear or release listed species but might encounter them during such activities as broodstock collection or monitoring may be permitted under Section 10(a)(1)(B).

7.3.2 Endangered Species Act Section 4(d) Authorization

ESA Section 4(d) applies only to the indirect or direct take of species listed as threatened and directs NOAA Fisheries or USFWS to issue regulations necessary to conserve species listed as threatened (also known as 4(d) rules). The Services use Section 4(d) rules to allow for regulatory flexibility and to help streamline ESA compliance for actions that have long-term benefits despite generally low levels of take in the short term and that do not contribute to the threats to the continued existence of a species. ESA Section 4(d) rules are federal actions that trigger consultation under Section 7 of the ESA. As a result, a Section 7 consultation must be completed prior to making a Section 4(d) determination. NOAA Fisheries has identified criteria (identified as “limits”) for fishery and hatchery plans that minimize impacts on listed salmon and steelhead. The Section 4(d) rules use the established limits to apply take prohibitions to all actions except those within the specified limits of the rules. If these criteria are met, then additional federal protections are not needed and so, under Section 4(d) of the ESA, take prohibitions would not apply. Actions that meet the Section 4(d) limits may be authorized by the Services.

7.3.3 Designating Experimental Populations under the Endangered Species Act: Section 10(j)

Section 10(j) of the ESA allows the Services to designate populations of listed species as "experimental" to support the reintroduction of at-risk species to foster long-term recovery. This designation allows the Services to re-establish self-sustaining populations in regions that are outside the species' current range when doing so fosters its conservation and recovery.

An experimental population is a geographically-described group that is isolated from other existing populations of the species. The Services must determine whether the population is "essential" to the survival of the species (i.e., the species will go extinct without the reintroduction of this population) or "non-essential" (i.e., the reintroduced population will contribute to restoring the species, but its recovery can be achieved without the population). Individuals in the experimental population are classified as threatened, not endangered, under the ESA. This designation allows the Services to reduce the legal protections required by the ESA, protecting individuals, municipalities, and others who may accidentally harm the fish while engaged in otherwise lawful activities.

Designating experimental allows the Services to advance recovery objectives by re-establishing self-sustaining populations, while simultaneously protecting private landowners, tribes, and local, state, and federal governments from ESA liabilities while they work to develop long-term conservation measures for the species.

7.3.4 The National Environmental Policy Act

NEPA (1970) requires federal agencies to review the environmental effects of any proposed actions they are implementing, funding, authorizing, or otherwise involved in. NEPA requires the federal government to use all practicable means to create and maintain conditions under which humans and nature can exist in productive harmony. The range of actions covered by NEPA is broad, ranging from federal land actions and publicly funded facilities, but also includes permit applications, such as for coverage under the ESA.

Federal agencies use the NEPA process to evaluate the environmental and related social and economic effects of proposed actions. The NEPA process also provides opportunity for public review and comment on the evaluations.

The NEPA process begins when a federal agency develops a proposal to take a major federal action, such as consultation under the ESA. Federal agencies prepare detailed statements assessing the environmental impact of, and alternatives to, major federal actions that may significantly affect the environment. The environmental review under NEPA can involve three different levels of analysis. An action may be categorically excluded if the federal action does not individually or cumulatively have a significant effect on the human environment. This is often not applicable to hatchery programs. If a federal agency determines that an action is not categorically excluded, an Environmental Assessment (EA) must then be prepared. The EA determines whether or not a federal action has the potential to cause significant environmental effects. Generally, the EA includes a brief discussion of:

1. The need for the proposed action
2. Alternatives to the proposed action
3. The environmental impacts of the proposed action and alternatives
4. A listing of agencies and persons consulted

If the agency determines that the action will not have significant environmental impacts, the agency will issue a Finding of No Significant Impact (FONSI). A FONSI is a document that presents the reasons why the agency has concluded that there are no significant environmental impacts projected to occur upon implementation of the action.

If the EA determines that the environmental impacts of a proposed Federal action will be significant, an Environmental Impact Statement (EIS) may be required. An EIS is normally reserved for actions determined to significantly affect the quality of the human environment. Individual hatchery programs normally do not trigger the need for an EIS. The regulatory requirements for an EIS are more detailed and rigorous than the requirements for an EA.

Biology and the NEPA Process

A thorough environmental review in an EIS or EA includes a discussion of the following biological resources:

1. Habitats and Vegetative Communities
2. Migratory Corridors
3. Plants, Wildlife, and Fisheries
4. Special Status Species (such as threatened and endangered species)

Impact Avoidance, Minimization, Mitigation and/or Compensation

One of the most important parts of the NEPA process is to determine which permits are required prior to an action, such as an ESA Section 7 Consultation. The NEPA process not only identifies actions that require authorization, but it allows the public an opportunity to comment on the proposed action.

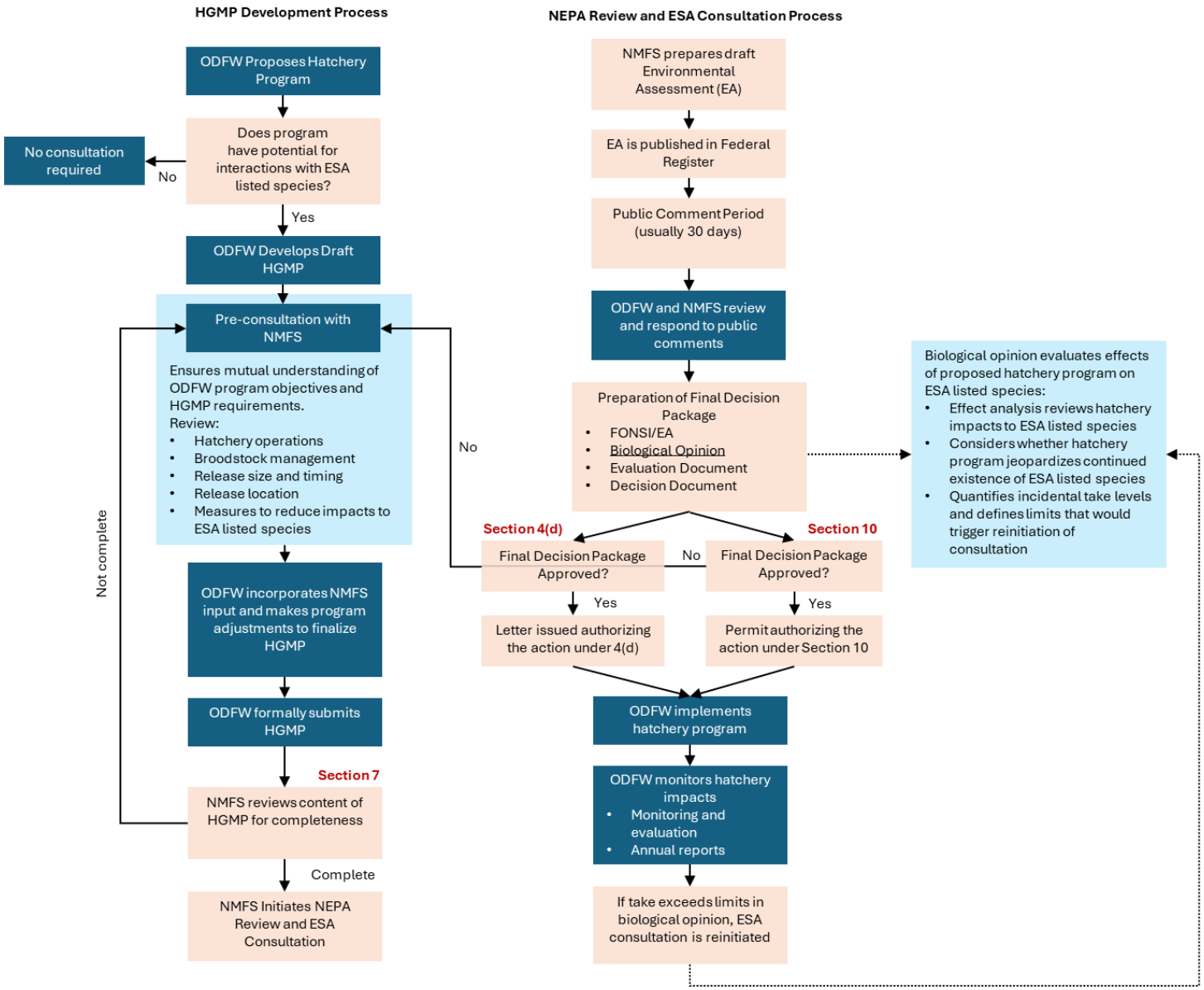

Figure 5. Federal Endangered Species Act consultation process for proposed hatchery programs under Section 4(d) and Section 10

7.3.5 Summary of the ESA Consultation Process

Although the entire scope of the ESA consultation process is quite complex, the consultation process for the operation of hatchery programs (the action) has been well defined. The ODFW may propose a hatchery program to NOAA Fisheries or USFWS for pre-consultation. If the program has no potential for interaction with a listed species or the only effects are beneficial, a finding of No Effect will conclude the process. If there may be an effect, the action may enter informal consultation and be resolved, or proceed to formal consultation. Under formal consultation, the process proceeds through Section 7 of the ESA and dependent on the status of listed species that may be affected and the scope of the proposed action, the consultation may be performed under Section 4(d) or Section 10. Formal consultation for a hatchery program requires development and submission of an HGMP by ODFW. Once the submitted HGMP has been determined to be sufficient, the ESA consultation process commences. The federal consulting agency initiates the NEPA review process by developing an EA and publishing it in the federal register for public comment. The EA (and public comments) is used to determine if the project will have a significant impact or not (the FONSI process). The EA and analysis of significant impact determine the type of consultation that will be required (informal or formal) and, if formal consultation is required, the type of authorization the action will require. The federal consulting agency develops a BiOp based on the HGMP and other information it requires to conduct an effects analysis, determines if the action jeopardizes the continued existence of the species, and quantifies incidental take levels and triggers that would reinitiate consultation. A final decision package is approved and the ODFW receives notice that it is authorized to implement the program under Section 4(d) or Section 10 of the ESA. The ODFW implements the hatchery program, conducts monitoring and evaluation, and produces an annual report. Reinitiation of the consultation may occur if take limits are exceeded, or if the action changes, a new species is listed, or critical habitat is designated or revised.

The ODFW operates hatchery programs to minimize risk to native natural populations and in particular, ESA listed populations. The management and implementation of hatchery program management strategies that minimize risk to natural populations is consistent with the terms and conditions and reasonable and prudent measure often included in the federal consultation decision documents. These strategies are crucial for the protection of native natural fish populations in Oregon and enable the ODFW to operate hatchery programs to provide the benefits of creating and enhancing fisheries opportunities and conservating native fish populations.

8 Conclusions

The ODFW operates numerous fish hatcheries, rearing ponds, acclimation sites, and trapping facilities. Operation of hatchery programs strives to achieve the benefits of the programs for fisheries and conservation while minimizing negative impacts to native fishes. Many of the programs operated at these facilities may directly or indirectly interact with federally listed threatened or endangered salmonid species, necessitating consultation under the federal ESA. The consultation process to obtain authorization under the ESA for a hatchery program involves numerous steps. The process entails, development of a HGMP, initiation of consultation with the listing federal agency, and following the consultation process through each step, working with the federal agency. Consultations may result in authorization to operate a program under Section 4(d) or Section 10 of the ESA, depending on if the listed species is threatened or endangered and if operation of the hatchery program may result in direct or indirect take. ESA authorizations typically contain reasonable and prudent measures (RPMs) and terms and conditions (T&Cs) in the biological opinion and ESA permit designed to minimize the risk of take of listed species. These RPMs and T&Cs must be met to operate the program. Under the ESA, the federal listing agency must develop a recovery plan that may contain additional measures that are designed to minimize risk and enhance the probability of recovery of the listed species that could affect the hatchery program. The ODFW has developed policy documents and management plans to address hatchery program operation, management practices to minimize impacts of hatchery programs on native fish populations, management practices for fish health in the fish hatcheries, and hatchery operational practices to avoid environmental impacts. The strategies in these hatchery conservation and management policies and plans are implemented to minimize impacts of hatchery programs on native, wild fish, including populations listed as threatened or endangered under the ESA. The ODFW has established a comprehensive approach to minimize the effects of hatchery program in the native, wild fishes of Oregon. These ODFW policies are also consistent with measures typically employed to minimize negative impacts on listed species.

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