Supplemental Environmental Assessment of the Wells Summer Chinook Hatchery and Genetic Management Plan

May 15, 2020

1. INTRODUCTION

This Supplemental Environmental Assessment (Supplemental EA) supplements the *2019 Environmental Assessment for Endangered Species Act Section 4(d) Approval and Section 10(a)(1)(A) Permit Issuance for Steelhead Hatchery Programs and Section 10(a)(1)(B) Permit Issuance for Summer/Fall and Fall Chinook Salmon Hatchery Programs in Upper Columbia River* (2019 EA) (NMFS 2019). NMFS is proposing to approve an additional 1,000,000 subyearling summer Chinook salmon from the Wells Hatchery under limit 5 of the 4(d) Rule of the Endangered Species Act (ESA). The Washington Department of Fish and Wildlife and Douglas County Public Utility District have submitted a Hatchery and Genetic Management Plan (HGMP) that outlines the supportive breeding, rearing, releasing, and associated monitoring and evaluation actions for the proposed hatchery program (WDFW 2019). The primary purpose of the proposed hatchery program is to augment the prey base of Southern Resident killer whale (SRKW).

This Supplemental EA expands upon the range of alternatives analyzed and may be used in future years. This Supplemental EA relies largely on the background information and analysis contained in the 2019 EA as no significant changes have occurred in the status of the Water Quantity, Water Quality, Salmon and Steelhead, Other Fish Species, Wildlife, Socioeconomics, Cultural Resources, Environmental Justice, and Human Health and Safety (i.e., the affected environment and baseline conditions remain the same). The 2019 EA analyzed a full range of alternatives, including different hatchery production levels. Although the 4(d) approval of the Wells Hatchery program was within the alternatives analyzed, the additional 1,000,000 production was not. The total overall Chinook and steelhead releases covered in the 2019 EA totaled 7,184,135. According to the Mitchell Act FEIS Table 3-11, the Columbia River basin releases total 140,593,000; the Interior Columbia releases total 61,392,000; and the Interior Columbia Chinook releases total 46,174,000 (NMFS 2014).

1.1. Proposed Action

The Proposed Action is for NMFS to approve the submitted HGMP (Table 1) under limit 5 of the 4(d) Rule.

Table 1. Hatchery program included in the Proposed Action

Program	Annual release groups	HGMP Receipt	Program Operator	Funding Agencies	Program Type and Purpose	ESA Pathway
Wells Summer Chinook for SRKW[1]	1.0 million subyearlings[2]	October 9, 2019	Washington Department of Fish and Wildlife and Douglas PUD[3]	Washington Department of Fish and Wildlife[4] and/or Pacific Salmon Treaty Funds	Segregated Harvest for SRKW recovery and sustainability	4(d) Limit 5

[1]SRKW = Southern Resident Killer Whale
[2] The 1.0M is an "up-to" value depending on funding. For Brood Year 2019, the program is being funded at the 500K production level.
[3]PUD = Public Utility District
[4]This will not include funding for Douglas PUD's normal operating and maintenance costs associated with their existing program obligations. Douglas PUD owns and operates Wells Hatchery.

1.2. Proposed Project Area

The Project Area is the geographic area where the Proposed Action would take place. It includes the areas immediately adjoining the hatchery facilities, acclimation sites, and weir locations, as described in the HGMP (WDFW 2019). For this Supplemental EA, the Project Area is the immediate surrounding area of the Wells Hatchery. This Project Area is within the geographic range of the Project Area that was analyzed in the 2019 EA.

1.3. Purpose and Need

NMFS proposes to make a determination under the ESA 4(d) Rule for the above-mentioned salmon hatchery program in the Upper Columbia River (UCR) basin. NMFS' purpose is to ensure the sustainability of UCR salmon and steelhead by conserving their productivity, abundance, diversity, and distribution and to meet the applicants' need to have their proposed hatchery program reviewed under the ESA.

1.4. Background

The 2019 EA provides details about the history of Columbia River hatchery programs as well as this action in relationship to other plans, regulations, agreements, laws, secretarial orders, and executive orders. These details have not changed and are not repeated here.

1.4.1.Description of Alternatives

There are four alternatives being considered in this Supplemental EA:

- **Alternative 1**: Under the No Action Alternative, NMFS would not make a determination under the ESA 4(d) Rule; however, NMFS assumes the new hatchery program would, nonetheless, be operated.[1]
- **Alternative 2**: Under the Proposed Action Alternative (Preferred Alternative), NMFS would make a determination that the submitted HGMP meets the criteria of limit 5 of the 4(d) Rule, and the proposed hatchery program would produce up to 1,000,000 Chinook salmon smolts annually.
- **Alternative 3**: Under the Reduced Production Alternative, the hatchery operators would submit a revised HGMP proposing the production of 500,000 Chinook salmon smolts (i.e., a 50 percent reduction), and NMFS would make a determination that the revised HGMP meets the criteria of limit 5 of the 4(d) Rule.
- **Alternative 4**: Under the No Production Alternative, the proposed hatchery program would not be implemented.

2. AFFECTED ENVIRONMENT

The affected environment is described in detail in the 2019 EA, and has not changed.

3. ENVIRONMENTAL CONSEQUENCES

3.1. Direct and Indirect Impacts of Alternatives 1, 2, 3, and 4

When describing environmental consequences, we compare Alternative 1 to the current environmental conditions and Alternatives 2, 3, and 4 to Alternative 1. Most of the consequences of the Wells summer Chinook hatchery program evaluated in this Supplemental EA were determined to have a negligible-adverse effect compared to Alternative 1 (Table 2). Negligible-beneficial and low-beneficial effects compared to Alternative 1 were the next most common designations (Table 2). These observations are similar to the impacts identified in the 2019 EA. We have footnoted where in Table 2 any effects are different from what was described in the 2019 EA. We have also described additional details on the impacts to Salmon and Steelhead, the resource where some impacts have changed. Because the environmental consequences of this Supplemental EA and the 2019 EA are largely the same, we have not repeated the justification here.

Table 2. Summary of the effects of the proposed hatchery program on the nine resources evaluated in this Supplemental EA.

Resource	Effect	Species	Alternative 1 No-action	Effects of Alternative Relative to No-action		
				2	3	4
Water Quantity	NA	NA	Low-adverse	Same as Alt.1	Negligible-beneficial	Negligible-beneficial

[1] The operators have indicated that this new program may not operate if they do not have ESA 4(d) authorization. However, we describe this scenario under Alternative 4.

Resource	Effect	Species	Alternative 1 No-action	Effects of Alternative Relative to No-action		
				2	3	4
Water Quality	NA	NA	Low-adverse	Same as Alt.1	Same as Alt.1	Negligible-beneficial
Salmon and Steelhead	Genetics	Spring Chinook Salmon	Undetectable	Same as Alt.1	Same as Alt.1	Same as Alt.1
		Steelhead	Undetectable[1]	Same as Alt.1	Same as Alt.1	Same as Alt.1[1]
	Competition and Predation	Spring Chinook salmon	Low-adverse	Same as Alt.1	Negligible-benefit	Low-beneficial
		Steelhead	Negligible-adverse[1]	Same as Alt.1	Low-beneficial	Low-beneficial
		Summer/Fall Chinook salmon	Negligible-adverse	Same as Alt.1	Low-beneficial	Low-beneficial
		Sockeye salmon	Negligible-adverse	Same as Alt.1	Same as Alt.1	Same as Alt. 1
		Coho salmon	Negligible-adverse	Same as Alt.1	Same as Alt.1	Low-beneficial
	Diseases	All (see Salmon and Steelhead)	Negligible-adverse	Same as Alt.1	Same as Alt.1	Same as Alt.1
	Population Viability	UCR Spring Chinook Salmon	Negligible-adverse	Same as Alt.1	Same as Alt.1	Low-beneficial
		UCR Steelhead	Negligible-adverse[1]	Same as Alt.1	Same as Alt.1	Low-beneficial
	Nutrient Cycling	All (see Salmon and Steelhead)	Low-beneficial	Same as Alt.1	Negligible-adverse	Low-adverse
	Facility Operations	All (see Salmon and Steelhead)	Undetectable[1]	Same as Alt.1	Same as Alt.1	Same as Alt.1
	Research, Monitoring, and Evaluation	All (see Salmon and Steelhead)	Undetectable[1]	Same as Alt.1	Same as Alt.1	Same as Alt.1
Other Fish Species	Competition and predation	See Table 13	Negligible-adverse	Same as Alt.1	Negligible-beneficial	Negligible-beneficial
	Prey enhancement	See Table 13	Negligible-beneficial	Same as Alt.1	Negligible-adverse	Negligible-adverse
	Disease	See Table 13	Negligible-adverse	Same as Alt.1	Negligible-beneficial	Negligible-beneficial
	Nutrient cycling	See Table 13	Negligible-beneficial	Same as Alt.1	Negligible-adverse	Negligible-adverse

Resource	Effect	Species	Alternative 1 No-action	Effects of Alternative Relative to No-action		
				2	3	4
	Facility operations	See Table 13	Negligible-adverse	Same as Alt.1	Same as Alt.1	Negligible-beneficial
Wildlife	Competition and predation	See Section 3.5	Undetectable	Same as Alt.1	Same as Alt.1	Negligible-adverse
	Prey enhancement	See Section 3.5	Negligible-beneficial	Same as Alt.1	Negligible-adverse	Negligible-adverse
	Disease	See Section 3.5	Negligible-adverse	Same as Alt.1	Undetectable	Negligible-beneficial
	Nutrient cycling	See Section 3.5	Low-beneficial	Same as Alt.1	Negligible-adverse	Negligible-adverse
	Facility operations	See Section 3.5	Negligible-adverse	Same as Alt.1	Negligible-adverse	Negligible-beneficial
Socioeconomics	NA	NA	Medium-beneficial	Same as Alt.1	Negligible-adverse	Negligible-adverse
Cultural	NA	NA	Low-beneficial	Same as Alt.1	Low-adverse	Medium-adverse
Environmental Justice	NA	NA	Medium-beneficial	Same as Alt.1	Negligible-adverse	Low-adverse
Human Health and Safety	NA	NA	Low-adverse	Same as Alt.1	Same as Alt.1	Low-beneficial

[1]See justification in the Salmon and Steelhead, Section 3.1.1

3.1.1.Salmon and Steelhead

Fish released from hatchery program can interact with natural-origin salmon and steelhead and their habitat through a variety of effects. Not all of these effects may occur through the hatchery program being analyzed in this Supplemental EA. In this section, the hatchery program effects under each alternative on natural salmon and steelhead populations in the Analysis Area are discussed and evaluated.

In the UCR, the Spring Chinook Salmon Evolutionary Significant Unit (ESU) [64 FR 14308, reaffirmed in 2005 (70 FR 37160) and in 2014 (79 FR 20802)] is listed as endangered. The UCR Steelhead distinct population segment (DPS) was originally listed as endangered (62 FR 43937), but in 2009, was downlisted to threatened (74 FR 42605, and reaffirmed in 2014 (79 FR 20802)). The listings for both species include natural- and hatchery-origin fish. The designated critical habitat for both species includes portions of the Methow Basin, Wenatchee Basin, and the Columbia River (70 FR 52630).

Other populations

The non-ESA-listed salmon and steelhead populations in the action area are Okanogan, Methow, Entiat, and Wenatchee summer/fall Chinook salmon, Okanogan and Wenatchee sockeye salmon, and coho salmon that are being reintroduced into the Methow and Wenatchee basins through the Mid-Columbia Coho Restoration program (NMFS 2014a).

Please see tables 3-6 and 3-7 in the 2019 EA for a full description of other fish and wildlife species that may interact with salmon and steelhead in the action area.

3.1.1.1. Genetics

The UCR Spring Chinook Salmon ESU and UCR Steelhead DPS could experience an increased risk of genetic impacts resulting from the Proposed Action. Therefore, the effects on the UCR Spring Chinook Salmon ESU and Steelhead DPS are analyzed in this subsection.

Summer Chinook salmon in general are not likely to interbreed with spring Chinook salmon (or steelhead) because they are generally separated in space and time of spawning. While summer Chinook salmon adults returning from the hatchery program have a high likelihood of interbreeding with naturally produced summer Chinook salmon in the UCR, the genetic risk is considered relatively low because pHOS has been low in almost all spawning areas under the current operations and pHOS goals (mean of ~5% recovery of hatchery-origin adults on spawning grounds) (Hillman et al. 2017; Richards and Pearsons 2015; Snow et al. 2017). As such, we predict that a 20% increase in the size of the hatchery program would have an undetectable genetic effect on the UCR spring or summer Chinook salmon and steelhead.

Under Alternative 2, the operation of the hatchery program would be the same as under Alternative 1, with no change in effects on natural spring Chinook salmon or steelhead genetics. Therefore, this alternative would also have the same undetectable effects for the Steelhead DPS and Spring Chinook Salmon ESU as Alternative 1. Under Alternative 3, a reduction of 50 percent of the summer Chinook released would most likely have the same undetectable effect on the UCR spring Chinook salmon ESU and Steelhead DPS for the reasons discussed above. Moreover, summer Chinook salmon do not spawn at the same time or area as spring Chinook salmon or steelhead, and reducing the number of returning hatchery fish will continue to have an undetectable effect on population genetic diversity. Under Alternative 4, the new hatchery program is not implemented and therefore there would be no detectable genetic effects from the program.

3.1.1.2. Competition and Predation

Under Alternative 1, the hatchery program would be operated. The competition and predation effects would be:

- Low-adverse for spring Chinook salmon. The potential effect of the hatchery releases of summer Chinook salmon on juvenile spring Chinook salmon would most likely be greater in the mainstem Columbia River in the Analysis Area than the tributaries because fish are released directly to the Columbia River Interaction between hatchery- and natural-origin juveniles in the tributaries is very unlikely because fish are released in the mainstem Columbia River and juvenile spring Chinook salmon could be migrating at the same time in the same areas as hatchery fish after release, meaning possible overlap for interactions through competition or predation. According to the PCD risk model used in the accompanying Biological Opinion, 32 Chinook and 1 steelhead adult equivalent

maybe lost to competition interactions from juvenile hatchery fish competing with natural-origin fish. No fish would be expected to be lost due to predation effects. Adult summer Chinook salmon returning from the hatchery program are not likely to compete for spawning sites, but may potentially superimpose redds; however, the overlap in time and space is not believed to be at a level of concern.

- Negligible-adverse for steelhead. It is not likely that juveniles released from the hatchery program will compete with naturally rearing steelhead because of how fast they migrate out of the streams where released. Adult hatchery summer/fall Chinook salmon are not thought to negatively interact with steelhead in any discernible way.
- Negligible-adverse for summer Chinook salmon. Newly emerged summer and fall Chinook salmon fry would be vulnerable as prey to migrating smolts that are released from the hatchery program. However, in general, during the smolt migration, most of the smolts in the mainstem Columbia River migrate in the bulk of the flow and the water clarity is reduced from snow melt, making predation potentially less likely. Summer and fall Chinook fry have been found to stay close to shoreline habitats until after the spring run-off and would be less likely to have spatial overlap with migrating smolts. Returning adult summer Chinook salmon overlap with natural-origin summer and fall Chinook salmon on the spawning grounds and may superimpose redds. Because the populations of summer and fall Chinook salmon in the UCR generally have a low demographic risk, the effects of some of the redds being superimposed is considered negligible. There is most likely some effect from competition and/or predation of hatchery summer Chinook on newly emerged summer and fall Chinook salmon.
- Negligible-adverse for sockeye salmon. Interactions between hatchery juveniles and sockeye smolts would occur in the mainstem Columbia River while emigrating to the ocean Interaction is likely minor. In their review of the same hatchery program, NMFS (2017) used a model to determine the effects of competition and predation from the hatchery summer Chinook salmon released; the model results suggest that there is limited effect on sockeye salmon within the mainstem Columbia River to McNary Dam. Since sockeye stage before spawning in lakes, and spawn at different times than the hatchery-origin returning adults in spawning areas upstream of summer Chinook salmon, the interaction between adult sockeye and returning adult fish from the hatchery program is not likely.
- Negligible-adverse for coho salmon. The smolts from the hatchery program may have spatial and temporal overlap with naturally rearing coho salmon in the maintstem Columbia River to McNary Dam. Hatchery fish are released into the mainstem Columbia River, therefore it is likely that some predation and competition occurs between hatchery juveniles and coho juveniles. Adult competition for spawning grounds and redd superimpositions are not likely to occur because of the difference in spawning time, and location for summer Chinook salmon.

Under Alternative 2, the operation of the hatchery program would be the same as under Alternative 1, with no change in release numbers and thus competition and predation effects on other salmon and steelhead species would remain the same. Therefore, this alternative would have the same effects as Alternative 1. Under Alternative 3, the effects of the hatchery program would be somewhat lower than under Alternative 1. The hatchery program would operate with

production reduced 50 percent compared to Alternative 1. The competitive and predatory effects of hatchery smolts would be reduced compared to Alternative 1, and the competitive effects of hatchery-origin adults are likely to be reduced compared to Alternative 1. Under Alternative 4, the hatchery program would not operate. Because there would be no summer Chinook salmon hatchery-origin smolts or adults, the competitive and predatory effects of the hatchery fish would eventually subside, although hatchery fish from other programs would still be interacting with natural-origin fish. Therefore, the effects would be low-beneficial to all species relative to Alternative 1.

3.1.1.3. Disease

Under Alternative 1, the hatchery program would be operated. No detections of exotic pathogens have occurred in recent years at the hatchery being evaluated in this Supplemental EA. Diseases that have occurred are caused by endemic pathogens, and hatchery operations would continue to use available treatments to keep these outbreaks in check. Therefore, all salmon and steelhead discussed here are negligibly-adversely affected. Under Alternative 2, the operation of the hatchery program would be the same as under Alternative 1, with no change in disease effects on other salmon and steelhead species. Therefore, this alternative would also have the same, negligible-adverse effect as Alternative 1 on all salmon and steelhead being evaluated in this EA. Under Alternative 3, the effects of the hatchery program would be the same as under Alternative 1. The program would operate with production reduced 50 percent compared to Alternative 1. However, the hatchery would continue to operate for other programs that would have similar disease effects on natural salmon and steelhead species. Therefore, this alternative would also have the same, negligible-adverse effect as Alternative 1 for all species. Under Alternative 4, the hatchery program would be terminated immediately. However, those facilities would continue to operate for other programs (e.g., spring Chinook salmon, coho salmon) and could have some disease effects on natural salmon and steelhead species. Therefore, this alternative would also have the same, negligible-adverse effect as Alternative 1 for all species.

3.1.1.4. Population Viability

The discussion here is limited to UCR Spring Chinook Salmon ESU and UCR Summer Steelhead DPS because these are the only species that have established population viability criteria. Under Alternative 1, the hatchery program would release the same number of smolts as under current conditions. The population viability would be:

- Negligible-adverse for the UCR Spring Chinook Salmon ESU and Steelhead DPS. The potential adverse impacts from the hatchery program on the spring Chinook salmon ESU would be the potential for redd superimposition from hatchery-origin summer Chinook salmon. Furthermore, the hatchery program may have some impacts on natural-origin juvenile spring Chinook salmon and steelhead through competition with hatchery juvenile summer Chinook salmon. These interactions have the potential to affect abundance and productivity of natural-origin spring Chinook salmon and Steelhead. However, since the likelihood for redd superimposition and competition is low because

of differences in spawning time and location, the effect of the hatchery program on the spring Chinook salmon ESU and Steelhead DPS is negligible-adverse.

Under Alternative 2, the operation of the hatchery program would be the same as under Alternative 1, with no change in population viability of UCR Spring Chinook Salmon ESU and UCR Steelhead DPS compared to Alternative 1. Therefore, this alternative would also have the same effect as Alternative 1 (i.e., negligible-adverse effect for UCR Spring Chinook Salmon ESU and low-beneficial effect for UCR Steelhead DPS). Under Alternative 3, the hatchery program would release 50 percent of the current production levels. The effect on the UCR Spring Chinook Salmon ESU and Steelhead DPS would be the same as Alternative 1 (negligible-adverse). Under Alternative 4, the hatchery program would be terminated immediately. Relative to Alternative 1, the population viability effects would be low-beneficial for UCR Spring Chinook Salmon ESU and Steelhead DPS. Since the current hatchery releases are negligible-adverse on the viability of the UCR Spring Chinook Salmon ESU, the designation for eliminating the program should improve population viability, although there is some potential that productivity may decrease because of less ocean-derived nutrients being available.

3.1.1.5. Nutrient Cycling

Under Alternative 1, the hatchery program would be operated. All the salmon and steelhead discussed here currently benefit from additional nutrient provided by the hatchery fish carcasses. Because summer Chinook hatchery-origin fish die after spawning naturally, the program provides a low-beneficial effect on salmon and steelhead that exist in the spawning streams through nutrient cycling. Under Alternative 2, the operation of the hatchery program would be the same as under Alternative 1, with no change in nutrient cycling effects on other salmon and steelhead. Therefore, this alternative would also have the same low-beneficial effect as Alternative 1. Under Alternative 3, the effects of the hatchery program would be slightly less as those under Alternative 1 because the hatchery program would operate with production reduced 50 percent compared to Alternative 1. This would mean that there would be fewer hatchery fish on the spawning grounds, and therefore, this alternative would have a negligible-adverse effect compared to Alternative 1, with change in effects smaller than under Alternative 4. Under Alternative 4, the hatchery program would be terminated immediately. Because hatchery-origin fish from the program would no longer be present on the spawning grounds, other salmon and steelhead would no longer benefit from nutrients provided to the environment by the hatchery carcasses. Therefore, termination of the hatchery program would have low-adverse effects on nutrient cycling for other salmon and steelhead relative to Alternative 1.

3.1.1.6. Facility Operations

Under Alternative 1, the hatchery program would be operated the same as under current conditions as described in the 2019 EA because the hatchery facility would continue operating regardless of the additional proposed hatchery program. Termination of the program would not result in termination of the hatchery facility. For these reasons, we would expect undetectable effects under Alternatives 1, 2, 4, and 4 from this current program.

3.1.1.7. Research, Monitoring, and Evaluation (RM&E)

RM&E would continue to operate regardless of the proposed hatchery program (i.e. no new activities are being proposed compared to what was described in the 2019 EA). Therefore, we would expect undetectable effects under Alternatives 1, 2, 3, and 4 from this current hatchery program.

4. CUMULATIVE IMPACTS

The expected impacts of the alternatives on all of the resources are described in Section 3, Environmental Consequences. Section 3 does not take into account future foreseeable actions, especially in the context of future climate change. This section considers impacts that may occur as a result of any one of the alternatives being implemented at the same time as other anticipated future actions and presents information in the context of future climate change. The cumulative impacts described in the 2019 EA apply to this Supplemental EA. Past, Present, and Reasonably Foreseeable Actions; Geographic and Temporal Scales; and Climate Change have not changed and are not repeated here. Moreover, the effects analysis has not changed substantially from the 2019 EA. Below, we describe cumulative impacts on the resources where effects as described in Section 3, Environmental Consequences, have changed since the 2019 EA.

4.1. Salmon and Steelhead

The expected direct and indirect effects of the alternatives on salmon and steelhead are described in Section 3, Environmental Consequences. The past actions as well as the current and future actions are the same as those described in the 2019 EA and are, therefore, not repeated here. These past, current, and future actions are also described extensively in the Mitchell Act EIS (NMFS 2104). In summary, past actions, such as land use practices from agriculture, livestock, and land development have reduced floodplain connectivity and riparian function and cover. Climate change in the Columbia River Basin may reduce the abundance and productivity of salmon and steelhead populations through the following mechanisms:

- Increased mortality may occur due to more frequent flood flows, changed thermal regime during incubation, and lower disease resistance
- Warmer winters would lead to higher metabolic demands, which may also contribute to lower winter survival if food is limited
- Warmer winters may increase predator activity/hunger, which can also contribute to lower winter survival

Changing environmental conditions are also likely to occur as a result of development and habitat restoration programs.

4.1.1.Alternative 1

The effects of the proposed hatchery program on salmon and steelhead have been discussed in Section 3. Considering the cumulative effects of past, present, and future actions and conditions, the release of hatchery fish from the program evaluated in this EA is not expected to be a major limiting factor negatively affecting the viability of salmon and steelhead in the UCR.

While the Wells summer Chinook releases in this Supplemental EA were not included in the Mitchell Act FEIS, we can infer similar results to another summer Chinook hatchery program out of Wells Hatchery. This is because the hatchery operations are identical for this new program, and the releases are similar in size to the subyearling and yearling summer Chinook programs already being operated at the Wells Hatchery (804,000 total released compared to 1M).

4.1.2.Alternative 2

Under Alternative 2, the effects would be the same as under Alternative 1.

4.1.3. Alternative 3

Under Alternative 3, the release numbers of fish would be reduced by 50 percent. While all populations of salmon and steelhead in the UCR have been affected to some degree by legacy effects (fisheries, dams, agriculture, and land use development) and will be affected in the future from these continued effects and the effects of climate change, the cumulative impact of this alternative depends on the specific population of natural fish in the subbasin or area where hatchery fish are released. Therefore, in summary, the overall effect of this alternative would be negligible.

4.1.4. Alternative 4

Under Alternative 4, the hatchery program evaluated in this EA would not be operated. As stated above, all populations of salmon and steelhead in the UCR have been effected to some degree by legacy effects (fisheries, dams, agriculture, and land use development) and will continue to be affected in the future from these effects, as well as those from other hatchery productions and climate change. Therefore, in summary, this alternative would probably have a minor demographic risk to summer Chinook salmon because most of the natural populations are already meeting abundance targets set by the state. Impacts to other populations of salmon and steelhead in the UCR would most likely be minimal.

5. Applicable Mandates: Federal Laws and Executive Orders

The applicable mandates are described in the 2019 EA and are not repeated here.

6. List of Preparers and Persons and Agencies Consulted

Natasha Preston
NOAA National Marine Fisheries Service

7. REFERENCES CITED

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