



Wild Fish Conservancy

N O R T H W E S T
S C I E N C E E D U C A T I O N A D V O C A C Y

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Submitted via email: RingoldSpringsRaceways@PublicInput.com

Re: COMMENTS ON DNS 25034: RINGOLD SPRINGS HATCHERY RACEWAY INSTALLATION

Introduction

Wild Fish Conservancy appreciates the opportunity to comment on the Determination of Non-Significance (DNS) for the proposed Ringold Springs Hatchery Raceway Installation. The State Environmental Policy Act (SEPA) checklist and supporting materials themselves demonstrate that the DNS is inadequate under SEPA. That inadequacy is further underscored by critical documents that were withheld from public review—such as the Biological Opinion for the Ringold Springs Upriver Bright Fall Chinook Salmon Hatchery Program—raising serious concerns about transparency and the public’s ability to meaningfully comment on the project’s probable significant adverse impacts. Given the scope of these impacts and the existing botulism contamination, it is inconceivable that the agency did not at minimum issue a Mitigated DNS. For these reasons, the DNS must be withdrawn and a full Environmental Impact Statement (EIS) prepared.

1. Failure to Disclose and Analyze Future Production and Program Expansion Connected to This Project

The SEPA Checklist frames the Ringold Springs Hatchery (RSH) raceway proposal as a limited “routine” construction activity, focused on installing three new concrete-lined large raceways (20' x 120') in the footprint of the existing west pond. However, this framing omits critical context: the project is directly connected to broader program expansions described in federal Biological Opinions, Hatchery and Genetic Management Plans (HGMPs), and Washington’s Southern Resident Orca (SRO) Prey Initiative.

First, the raceways being replaced are not currently in use due to fish health issues, primarily botulism. By constructing new raceways in this footprint, WDFW is not simply conducting maintenance—it is expanding production capacity that has been reduced.

In the 2020 Biological Opinion for the Ringold Springs Upriver Bright Fall Chinook Salmon Hatchery Program (NOAA 2020), NOAA Fisheries documented plans by WDFW and the U.S. Army Corps of Engineers

(the Corps) to expand production of Upriver Bright (URB) fall Chinook from 3.5 million juveniles annually to 8.15 million—a more than 130% increase in output. The accompanying HGMP outlined a phased approach: an initial increase from 3.5 million to 4.5 million sub-yearlings, followed by full build-out to 8.15 million, with broodstock collection, rearing, and acclimation activities consolidated at RSH. These expansions explicitly assumed significant facility upgrades—new intakes, holding ponds, and rearing infrastructure—directly tying new construction at Ringold to scaled-up hatchery production. NOAA further explained that these expansions were expected to increase prey availability for Southern Resident killer whales (SRKW), projecting that 8.15 million sub-yearling releases could provide an additional 24,124 adult Chinook annually to coastal prey availability. However, NOAA has never assessed the potential for these hatchery released fish to further decrease prey availability by expanding fishing pressure and harming long-term wild salmon recovery.

The state’s SRO Prey Initiative reinforces this connection. Table I-1 of the 2021 Hatchery Master Plan (WDFW 2021) identifies a \$3.641 million state investment between 2023–2027 to replace ponds at RSH, confirming that this construction is part of planned production increases. WDFW itself confirmed in 2020 that RSH was annually receiving 250,000 coho for rearing and acclimation under the Initiative¹. These facts demonstrate that the facility upgrades are not routine maintenance—they are integral components of a coordinated, state-funded hatchery expansion that has not been evaluated under SEPA.

Despite this, the DNS is silent on these connections. The SEPA Checklist response to Question A.7 (“Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal?”) answered “No.” Yet the same SEPA materials acknowledge that the new raceways “*play a vital role in current and future production at Ringold.*” This omission is misleading in light of federal and state documents describing a facility build-out and expanded hatchery releases directly tied to the SRO Prey Initiative.

This failure is not isolated. In 2023, the SEPA Checklist for the Ringold River pump station (DNS 23-001) similarly answered “No” to Question A.7, despite that project also following the 2020 BiOp and supporting facility expansion². These repeated failures reflect a systemic pattern: WDFW consistently excludes review of hatchery production impacts and expansion plans when evaluating capital projects under SEPA, thereby evading programmatic and cumulative analysis.

This omission is not unique to Ringold. In recent SEPA reviews for the Deschutes Watershed Center Hatchery (MDNS 24-059) and the Voights Creek Hatchery Modifications (DNS 22-050), WDFW used the same tactics: segmenting facility construction from associated production increases and invoking the “routine release” exemption to avoid analyzing cumulative impacts.

- In Deschutes, WDFW stated: “*WDFW is committed to producing and releasing approximately 3.8 million salmon smolts annually within the watershed. This baseline program has been in operation*

¹ Washington Department of Fish and Wildlife, *WDFW announces spring Chinook fishery closure* (Facebook, Nov. 18, 2020), <https://www.facebook.com/WashingtonFishWildlife/photos/a.390652606760/10157402941556761>

² Washington Department of Fish and Wildlife, *SEPA Environmental Checklist: Ringold Springs Proposal* (Jan 10, 2023), <https://wdfw.wa.gov/sites/default/files/2023-01/checklist-ringoldsepaproposaljan2023.pdf>.

since 1953. Production levels have been strategically reduced over the years to reach the current level of 3.8 million... This is the condition of the existing environment. Please note that hatchery production is exempt from SEPA under WAC 197-11-835(5)." Yet draft HGMPs submitted to NOAA identified plans to more than double production to 7.8 million fish to support the SRO Prey Initiative.

- In Voights Creek, the DNS explicitly stated the purpose of facility modifications was to increase Chinook production by one million fish under the SRO Prey Initiative, yet WDFW still issued a DNS rather than preparing an EIS and treated the massive expansion as "routine".

Together with Ringold, these examples demonstrate a systemic pattern of improper segmentation and misuse of categorical exemptions in WDFW's hatchery SEPA reviews. Projects are repeatedly characterized as "routine" or "maintenance" even when they directly propose large production increases with significant ecological consequences. This pattern deprives the public of meaningful review of connected and cumulative impacts, contrary to SEPA's core requirements.

WDFW's repeated invocation of the categorical exemption for the "[r]outine release of hatchery fish" under WAC 197-11-835(5) is misplaced. That exemption is narrowly tailored to cover only ongoing, status quo hatchery releases where there are "only minor documented effects" on other species. It cannot reasonably be stretched to cover unprecedented expansions in production— such as the SRO Prey Initiative's 50 million additional smolts or the multi-million Chinook smolt increases contemplated at RSH in the 2020 BiOp.

In litigation, WDFW has gone so far as to argue that *"WDFW has routinely released chinook salmon from hatcheries for over half a century, at numbers far greater than the current numbers being released after implementing the Orca Prey Initiative."* This claim mischaracterizes SEPA's requirements. The statute requires analysis of *current and proposed actions* and their probable significant impacts; it does not allow agencies to avoid review by pointing to historical production peaks decades earlier. Framing new expansions as "routine" because hatcheries once produced more fish is not a lawful exemption under SEPA, especially given those reductions were directly tied to environmental impacts caused by the total number of hatchery fish released.

Expansions of this scale are precisely the type of non-routine, connected actions that SEPA requires agencies to analyze through a comprehensive EIS. WDFW's own science acknowledges these expansions have far more than minor effects, including genetic, ecological, and disease risks for wild salmonids. In its 2020 report reviewing hatchery science and reform (WDFW 2020a), WDFW identified a core theme: *"program size requires more careful scrutiny and scientific justification because it affects virtually every aspect of hatchery risks."* Yet in the DNS for Ringold, WDFW fails to apply this principle, treating a program more than doubling in size as "routine" and exempt from SEPA review.

This position is consistent with WDFW's broader claim that the SRO Prey Initiative itself is exempt from SEPA, a position now being challenged in active litigation. In 2018, the Commission voted to expand hatchery production by 50 million smolts annually under the Initiative without conducting SEPA review. WDFW has since continued expanding hatchery releases and funding capital projects under the SRO Initiative without ever analyzing cumulative environmental impacts.

The Ringold raceway project is therefore part of a larger, statewide program that has never undergone the legally required environmental review. By segmenting this construction project from the SRO Initiative, WDFW is improperly avoiding SEPA's mandate to evaluate connected and cumulative actions (WAC 197-11-060(3)(b)). The public is thus denied the ability to understand how these new facilities are linked to anticipated expansions across multiple species and facilities, and what cumulative risks they pose to wild salmonids, SRKW, and ecosystem health.

For these reasons, the DNS should be withdrawn, and WDFW should prepare a comprehensive EIS addressing both this facility-specific expansion and the broader SRO Prey Initiative under which it is funded. Anything less continues the unlawful piecemealing of hatchery capital projects to avoid programmatic SEPA review.

2. Failure to Analyze Botulism Risks to the Environment and Public Health

The SEPA materials confirm that the raceways this project intends to replace are not currently in use due to persistent botulism contamination. WDFW acknowledges that repeated mitigation attempts—including tilling, lime treatment, and chemical applications—have all failed to eliminate the pathogen, which is known to persist in soils for decades (Espelund and Klaveness 2014). No reasonable decision-maker could conclude that botulism contamination — a pathogen known to kill fish, wildlife, and even humans — poses no environmental or public health impact to the surrounding community and ecosystem. This is a critical admission that the facility sits on a site with a history of persistent and unresolved contamination.

Despite this, the DNS does not analyze the foreseeable risks of constructing new raceways on top of contaminated soils. Botulism spores can remain viable for decades, and outbreaks have historically caused large-scale mortality events for hatchery fish and wild waterfowl (Uzal 2024). As the project involves placing new infrastructure within the footprint of a contaminated pond, the risk is not speculative or remote.

Treating Contamination as a Construction Problem

The checklist frames botulism as a problem of infrastructure rather than contamination. WDFW acknowledges persistent botulism in soils but proposes no environmental health analysis. Instead, it presents construction of new concrete raceways as the “solution,” as though covering contaminated ground with new structures resolves the risk. This approach treats engineering as a substitute for environmental review.

Rather than analyzing the degree of contamination, how it may be mobilized during construction, or whether it poses risks to fish, wildlife, and human health, the DNS assumes that new structures will eliminate the problem. This assumption is unsupported by evidence and falls short of SEPA's requirement that agencies take a “hard look” at probable significant impacts.

Procedural Inconsistency in SEPA Checklist Responses

The SEPA environmental checklist contains internal contradictions that undermine the validity of WDFW's threshold determination. In the project description, WDFW acknowledges that the west pond has been closed due to fish health issues “primarily botulism” and that eradication efforts have failed. Yet, in Section

7 (Environmental Health), the checklist states, “Are there any environmental health hazards...?” to which the state answered ‘No’. When asked to ‘Describe any known or possible contamination at the site from present or past uses’, WDFW answered ‘None Known’.

These responses are plainly inconsistent with the project description that acknowledges the site is contaminated with ‘primarily botulism’. Further, the use of the word ‘primarily’ suggests that other fish health pathogens that were not disclosed are also present at the site. SEPA requires agencies to provide full, accurate, and consistent information to allow meaningful review of probable significant adverse impacts. Here, botulism contamination is admitted in one section and denied in another, with no substantive analysis of its risks to fish, wildlife, or human health. This procedural inconsistency alone warrants withdrawal of the DNS and preparation of a revised checklist and threshold determination.

Failure to Address Contaminated Sediment Disposal

The DNS and checklist also fail to explain how sediment from the contaminated pond will be managed. The proposal involves placing approximately 1,800 cubic yards of fill and substantial earthwork within the footprint of a pond with a documented history of botulism contamination. Yet there is no discussion of:

- Whether contaminated sediments will be excavated, stockpiled, transported, or otherwise disturbed during construction;
- How such materials will be tested, contained, or disposed of to avoid spreading pathogens;
- Whether contamination risks to local groundwater, nearby wells, drinking water sources, or the Columbia River have been evaluated.

Given that *Clostridium botulinum* spores can remain viable in soil and sediments for decades and can spread through disturbed soils and water movement, this omission is significant. Construction activities present a direct pathway for pathogens to be mobilized within and beyond the project site.

Constructing new raceways in a contaminated footprint risks spreading *C. botulinum* into the new facilities, potentially undermining fish survival and production. Given that WDFW describes these raceways as playing a “vital role in current and future production at Ringold,” this raises foreseeable risks to both hatchery and wild fish but also to ESA-listed wild salmonids downstream if contaminated effluent or diseased fish are released or other ESA-listed species that prey on contaminated hatchery and wild salmonids.

Without an analysis of sediment handling and disposal, the DNS does not provide the public or decision-makers with sufficient information to determine whether or to what degree the project poses significant environmental or public health risks. At minimum, a full Environmental Impact Statement (EIS) is needed to evaluate these pathways and prescribe enforceable mitigation measures.

Environmental Risks

The DNS fails to evaluate the significant environmental risks posed by botulism contamination at RSH. Botulism is not a speculative threat: it has been repeatedly documented in aquaculture and natural systems, and outbreaks have killed hatchery fish, wild fish, and waterfowl (Uzal 2024). Despite

acknowledging persistent contamination in the west pond, WDFW provides no analysis of how the proposed project could exacerbate or spread these risks.

Type E botulism—the most common type of *Clostridium botulinum* found in marine and fresh water, soil, and fish in North America—has caused large-scale mortality events in salmonid aquaculture facilities, particularly among Chinook, coho, steelhead, and rainbow trout—the same species WDFW rears at Ringold. Spores and toxins have been detected in sediments, dead fish, and pond invertebrates, with carcasses serving as a major source of toxin spread through predation. Outbreaks have historically been so severe that the disease has been called “bankrupt disease” because of the economic losses it causes in hatcheries or fish farms (Uzal 2024). The DNS fails to evaluate how and if hatchery effluent and disturbed sediments provide a pathway for botulism spores and toxins to reach the Columbia River, where ESA-listed salmonids migrate and rear.

Botulism outbreaks in fish are also known to trigger secondary outbreaks in piscivorous birds (Uzal 2024; Alexander et al. 2024). Sick or moribund fish display abnormal behaviors, making them easy prey for gulls, herons, eagles, and other fish-eating birds. These birds then ingest lethal doses of toxin, causing cascading die-offs. Scientific literature and other reporting have documented mass botulism die-offs of fish or waterfowl in systems such as the Great Lakes and Klamath Basin. For example, in 2024, a massive avian botulism outbreak at the Tule Lake / Klamath Basin refuge complex killed tens of thousands of migratory waterbirds, with reports of 55,000 or more dead and some estimates exceeding 100,000 birds (Hertel 2024; Neumann 2024). The DNS does not address this well-established transmission pathway.

The DNS also fails to consider if and how climate change impacts could exacerbate botulism risks at RSH. Outbreaks of *Clostridium botulinum* are closely tied to specific environmental conditions, including:

- Warm water temperatures — Outbreaks often occur in late summer and early fall when hatchery facilities and rivers are warmest. Climate change is driving higher baseline water temperatures and more frequent heat waves, making these conditions increasingly common in the Columbia Basin.
- Low-oxygen (anaerobic) conditions — The bacteria thrive in stagnant, oxygen-depleted environments, which are more likely as climate change alters artificial rearing environments, river flows, increases algal blooms, and reduces summer streamflows.
- Fluctuating water levels — Reduced snowpack, altered runoff patterns, and prolonged drought create shallow, warm conditions that concentrate nutrients and organic matter, further fueling outbreaks.
- Carcass-driven amplification — As mortality events increase under stressful climate conditions, carcasses provide the anaerobic environment that allows spores to germinate and produce lethal toxin, creating a self-perpetuating outbreak cycle.

The Columbia River Basin is not immune. By failing to consider how climate change magnifies these risks, WDFW has again avoided a required “hard look” at probable significant environmental impacts under SEPA. By failing to assess all of these environmental risks — to hatchery fish, ESA-listed salmonids, waterfowl, and the broader ecosystem — WDFW has not met its obligation under SEPA to evaluate

probable significant adverse impacts. An Environmental Impact Statement (EIS) is required to analyze these risks, identify monitoring and containment measures, and ensure the project does not perpetuate or worsen botulism contamination at this site or in the Columbia Basin.

Human Health Concerns

The DNS frames botulism solely as a fish health issue, ignoring its significant human health implications. Botulism toxins, produced by *C. botulinum*, can cause serious illness, including difficulty breathing, muscle paralysis, and even death (CDC 2024). Human and avian diseases caused by *C. botulinum* type E have been associated with the consumption of fish and marine mammals (Uzal 2024).

By denying the existence of any environmental health hazard in Section 7 of the checklist, WDFW overlooks the risk to people who live, work, or recreate in the vicinity of the hatchery. This includes:

- Local communities and drinking water users who could be exposed if contaminated sediments or effluent enter groundwater or the Columbia River.
- Fishers, hunters, and recreationists who may come into contact with infected fish or waterfowl.
- Hatchery staff and contractors who will be directly exposed to disturbed sediments during construction and ongoing operations.

The project's location in a floodplain further elevates these risks, as high flows could transport contaminated soils or effluent into the Columbia River system, creating potential exposure pathways for humans and wildlife. Despite these foreseeable hazards, the DNS does not analyze potential human health consequences, nor does it outline safeguards for safe handling or disposal of contaminated material.

The DNS also does nothing to analyze the potential risks of humans consuming fish or birds infected with botulism. Traditional preservation methods such as canning and smoking are known pathways for human botulism when contaminated meat is processed under anaerobic conditions.

The absence of analysis of these human health pathways is a glaring deficiency in the DNS. SEPA explicitly requires consideration of risks to public health as well as ecological impacts. By ignoring this dimension of risk, WDFW fails to provide the public and decisionmakers with a complete picture of the consequences of proceeding with construction at this contaminated site. Without such analysis, the DNS fails to provide a credible basis for the claim that this project will not have probable significant adverse impacts.

3. Failure to Provide Public Transparency and Accountability

SEPA is not only a technical statute; it is also a public disclosure law designed to ensure citizens have meaningful access to the information necessary to evaluate state actions before they are undertaken. The DNS for the RSH project undermines that core purpose.

Critical documents—most notably the 2020 Biological Opinion governing hatchery operations at Ringold—were not included in the SEPA record. Instead, WDFW relies on conclusory statements in the checklist while withholding the very documents that describe the scale of production increases and associated

environmental risks. The absence of these materials deprived the public of the ability to review and comment on the actual impacts of the proposal.

Equally troubling are the inconsistencies and omissions within the checklist itself. The same materials that acknowledge persistent botulism contamination simultaneously deny that any environmental health hazards exist at the site. Responses to direct questions about planned expansion (Checklist Question A.7) deny future activity while internal documents and state and federal planning records show extensive production increases are anticipated. These contradictions erode public trust and obscure the true nature of the agency's decision.

More broadly, the Ringold review reflects a systemic problem: for decades, WDFW has conducted SEPA only on hatchery construction projects while consistently avoiding review of the impacts of the hatchery programs those facilities enable. We are not aware of a single programmatic SEPA analysis ever having been prepared to evaluate the cumulative ecological, genetic, and disease impacts of hatchery operations on wild fish populations.

Through prior hatchery policies, i.e. C-3619, WDFW issued a DNS on the overarching policy and committed to phased review of individual hatchery programs and their cumulative impacts through future phased review, however those subsequent reviews never occurred (WDFW 2020b).

This pattern continues with the current hatchery policy—the Anadromous Salmon and Steelhead Hatchery Policy (C-3624)—in which WDFW also issued a DNS on the overarching policy while promising to develop a Technical Procedures Document (TPD) within one year of adoption, subject to SEPA review. That TPD was intended to guide the development of Hatchery Management Plans (HMPs) for individual hatchery programs, which would themselves undergo SEPA review and evaluate program-specific risks to wild salmon, steelhead, and their ecosystems. Yet, neither the TPD nor a single HMP has ever been developed.

By advancing capital projects like the Ringold raceways before completing the promised TPD and HMP reviews, WDFW is putting the cart before the horse—authorizing construction that predetermines production outcomes before ever analyzing whether those outcomes are environmentally or legally acceptable under SEPA.

The Department continues to rely on piecemeal construction reviews that segment facilities from the production they are designed to support or on the illegal exemption of review by claiming all production falls under “routine.”

This practice frustrates SEPA's fundamental goals of disclosure, informed decision-making, and accountability, while depriving the public of the opportunity to weigh in on the true environmental consequences of hatchery policy.

By failing to provide a complete, accurate, and transparent record, WDFW has frustrated SEPA's purpose of informed public participation. Agencies cannot satisfy SEPA by offering the public partial or contradictory information while reserving critical documents and decisions for later processes. Meaningful accountability requires full disclosure of the project's context, risks, and cumulative impacts at the threshold determination stage.

Conclusion

The Ringold Springs Hatchery Raceway Installation is not a routine maintenance project. It is a key component of both federal and state programs to expand hatchery production both under the 2020 BiOp and under the SRO Prey Initiative—a program that has never undergone SEPA review despite its immense scope, financial cost, and significant impacts. The SEPA checklist mischaracterizes expansion as maintenance, denies the presence of persistent botulism contamination, omits critical documents, and fails to address foreseeable risks to fish, wildlife, and human health.

These are not isolated errors. For decades, WDFW has evaded SEPA review of hatchery production by limiting environmental review to piecemeal construction projects, segmenting facilities from the programs they are designed to support, or by invoking the “routine release” exemption to shield even unprecedented expansions from scrutiny. In litigation, WDFW has gone so far as to claim that hatchery production today is exempt because hatcheries once produced even greater numbers decades ago. At the same time, WDFW’s own 2020 hatchery science review admitted that *“program size requires more careful scrutiny and scientific justification because it affects virtually every aspect of hatchery risks.”* The Department cannot acknowledge the risks of scale in one context and then dismiss those risks as “routine” in another. This reasoning ignores the reality that wild fish populations have precipitously declined, climate change is exacerbating every known hatchery risk, and today we have far greater scientific understanding of the risk hatcheries pose to wild salmonids and their ecosystems than we did in earlier decades.

SEPA’s mandate is clear: agencies must take a “hard look” at the probable significant environmental consequences of their actions before committing public funds. WDFW’s systemic practice of segmenting, exempting, and withholding information frustrates that mandate and denies the public the transparency and accountability SEPA requires.

For these reasons, the DNS for this project must be withdrawn. WDFW should prepare a comprehensive Environmental Impact Statement that evaluates the Ringold expansion in its proper context: as part of a coordinated, statewide hatchery expansion policy under the SRO Prey Initiative. Only through such comprehensive review can the public and decisionmakers understand the true scope of impacts, weigh alternatives, and ensure that taxpayer funds are not committed to projects that perpetuate ecological and human health risks. Anything less continues the unlawful piecemealing of hatchery capital projects to avoid programmatic SEPA review.

Citations

Alexander N, Dickinson A, Benson TJ, Ford TW, Mateus-Pinillam N, Arneson J, Davis MA, et al. *Waterbird Disease in the United States Laurentian Great Lakes under Climate Change*. J Great Lakes Res. 2024;50:102450. <https://doi.org/10.1016/j.jglr.2024.102450>.

Eklund MW, Poysky FT, Wielinga BA, et al. *Susceptibility of coho salmon, *Oncorhynchus kisutch* (Walbaum), to different toxins of *Clostridium botulinum**. Aquac Res. 2004;35:594–600. <https://doi.org/10.1111/j.1365-2109.2004.01061.x>.

Espelund M, Klaveness D. *Botulism outbreaks in natural environments – an update*. Front Microbiol. 2014;5:287. <https://doi.org/10.3389/fmicb.2014.00287>.

Hertel, Meghan. *Avian Botulism Kills 40,000 Birds at National Wildlife Refuge*. The Revelator. Oct. 9, 2020. <https://therevelator.org/avian-botulism-klamath/>.

National Marine Fisheries Service, West Coast Region. *Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Consultation: Ringold Springs Upriver Bright Fall Chinook Salmon Hatchery Program*. 2020. <https://doi.org/10.25923/qwnt-c255>.

Neumann, Erik. *Up to 55,000 Birds Have Died in the Klamath Basin Botulism Outbreak*. OPB. Sept. 17, 2024. <https://www.opb.org/article/2024/09/17/klamath-lake-botulism-outbreak-migratory-birds-basin-wildlife-refuge-complex/>.

Uzal FA, Henderson E, Asin J. *Botulism in fish: a review*. J Vet Diagn Invest. 2024;36(3):312–318. <https://doi.org/10.1177/10406387241236725>.

Washington Department of Fish and Wildlife. *A Review of Hatchery Reform Science in Washington State*. Jan. 23, 2020. https://wdfw.wa.gov/sites/default/files/publications/02121/wdfw02121_0.pdf.

Washington Department of Fish and Wildlife. *WDFW Hatchery and Fishery Reform Policy Implementation Assessment: Final Report, 2009-2019*. Aug. 11, 2020. https://wdfw.wa.gov/sites/default/files/publications/02121/wdfw02121_0.pdf.

Washington Department of Fish and Wildlife. *Hatchery Improvement Master Plan – Southern Resident Killer Whale Prey Enhancement*. Jan. 1, 2021. <https://wdfw.wa.gov/sites/default/files/publications/02213/wdfw02213.pdf>.