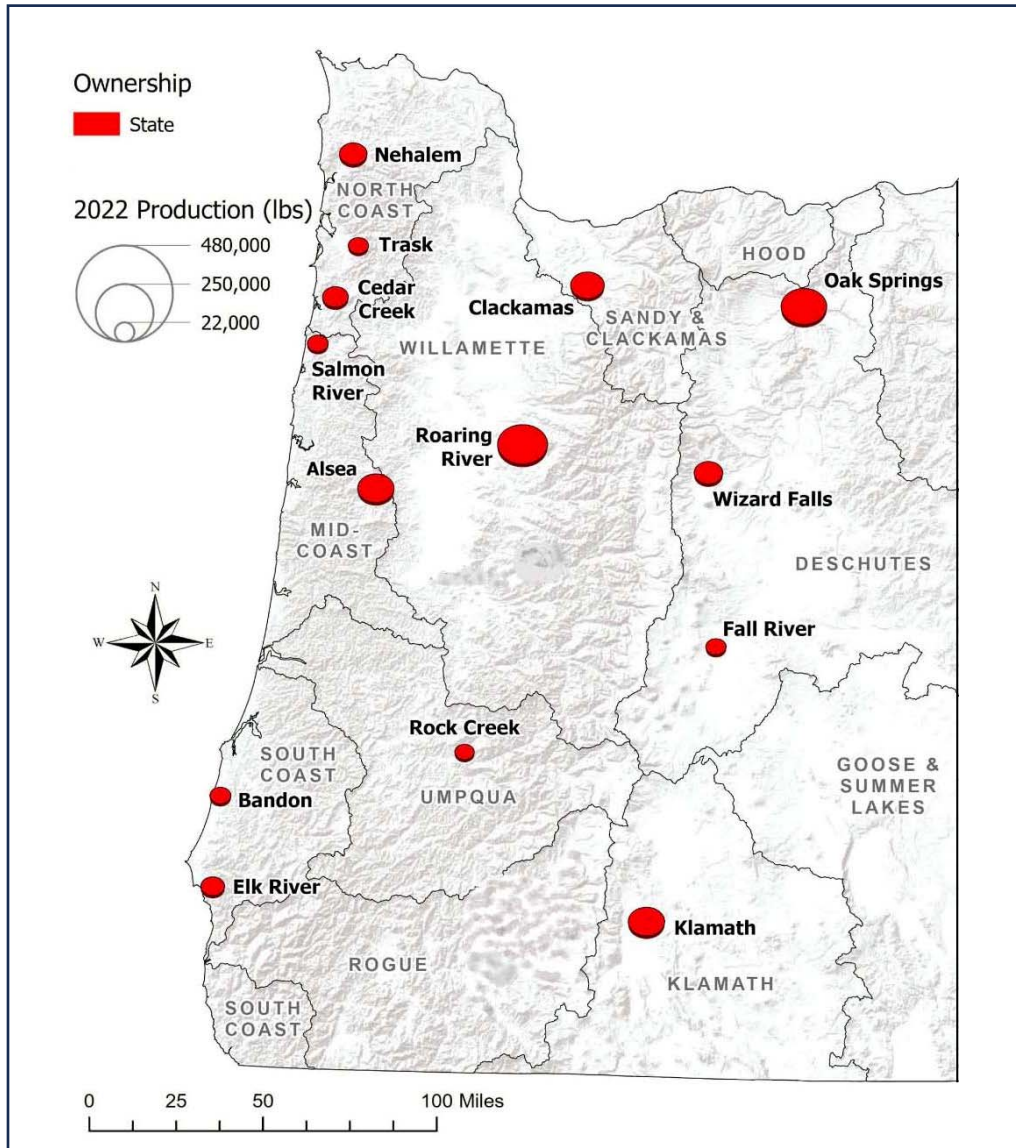


State Owned Hatchery Economic Analysis Technical Report



Oregon Department of Fish and Wildlife

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**State Owned Hatchery Economic Analysis
Technical Report**

for the

**LOOKING AHEAD: Charting a Sustainable Future for
Oregon's Hatchery System Project**

Prepared for

Oregon Department of Fish and Wildlife

Prepared by

**The Research Group, LLC
Corvallis, Oregon**

November 6, 2024

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Preface and Acknowledgements

This study report was prepared for the Oregon Department of Fish and Wildlife (ODFW) by The Research Group, LLC (TRG), Corvallis, Oregon. The primary author at TRG was Shannon Davis who was greatly assisted by Kari Olsen. While this report had a primary author, there were other contributors providing guidance on the economic analysis underpinnings. Hans Radtke, Ph.D. Natural Resource Consultant provided valuable assistance for understanding the economics of hatchery operations and sustainable funding mechanisms. Chris Carter, Ph.D., retired ODFW staff economist was the principal investigator for the original Oregon coastal hatchery economic model that was subsequently updated and used twice more in the last 20 years to evaluate hatcheries net economic benefits. The present study mimics methods used by Dr. Carter. Gil Sylvia, Ph.D. retired executive director Coastal Marine Experiment Station reviewed report drafts and gave thoughtful and invaluable advice on report content.

The report was prepared to inform decision making about the future of Oregon's hatchery system. It is a companion report to other publications provided by third-party contractors also retained to review the hatchery system. The study design draws substantially on economic modeling methods, data, and results described in previous TRG hatchery economic analysis studies. Recounting and paraphrasing those study publications are used in this report sometimes without attribution.

The ODFW study leaders were Shaun Clements, Deputy Director for Fish and Wildlife Programs; Scott Patterson, Fish Propagation Program Manager; and, Chris Lorion, Native Fish Conservation Coordinator. Scott was instrumental in providing hatchery budget and capital improvement information. Chris with assistance from Micki Varney, Stock Assessment Biologist was helpful in gathering data for hatchery production and adult survival-to-fisheries rates. Brandy Nichols, Budget and Economics Program Manager and her team (Camilla Kennedy and Seth Urbanski) provided timely information about Department revenue streams. John Seabourne, Fish Division Operations Manager provided detailed hatchery budget data and interpretations. Site visits were made by TRG to about half of the State hatcheries. ODFW hatchery coordinators and individual hatchery managers were generous in their time and need to be complimented for their helpful spirit in providing information about production processes. Finance directors in surrounding states provided their state budget profiles and hatchery production numbers. Finally, because authorization was not sought to mention names, there were many other TRG colleagues and ODFW staff that need to be thanked anonymously for their advice.

Numerous coordination meetings were held with ODFW study leaders during the development of this report. The meetings had thoughtful and informative conversations regarding data availability and hatchery financing. Meeting results helped define study direction and depth. ODFW staff provided early draft report reviews. Relevant review comments from ODFW study leaders and other peers were carefully considered and addressed in preparation of this study's final report. The review feedback helped make the study findings as sound as possible and ensures the report meets standards for objectivity, evidence, and responsiveness to the study

charges. Although reviewers provided many useful comments and suggestions, they were not asked to endorse study results. The authors are solely responsible for content.

The report contains methodologies recommended with the understanding that technically sound and defensible approaches would be used. Where judgment became necessary, conservative interpretation was to be employed. Because this philosophy was strictly adhered to in all aspects of the report, the materials developed are deemed useful descriptions of economic implications and contain reasonable estimates of current hatchery system economic effects.

The report is prepared to assist in decision making. The author's interpretations and recommendations should prove valuable for that purpose, but no assurance can be given that decisions based on this plan will fulfill expectations of market demands nor achieve financial projections. Government legislation and policies, market circumstances and other situations can affect the basis of assumptions in unpredictable ways and lead to changes in study conclusions. Neither the study sponsor, nor author, nor any person acting on their behalf makes any warranty of representation, expressed or implied, with respect to the accuracy, completeness or usefulness of the information contained in this document, or that the use of any information, apparatus, method, or process disclosed in this document may not infringe on privately owned rights.

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List of Acronyms

BCA	benefit-cost analysis
C&S	ceremonial and subsistence
CDFW	California Department of Fish and Wildlife
CPUE	catch per unit effort
CEA	cost effectiveness analysis
DV	direct value
FY	fiscal year
GDPIPD	Gross Domestic Product Implicit Price Deflator
HPMP	Hatchery Program Management Plan
IDFG	Idaho Department of Fish and Game
MA	Mitchell Act
NEV	net economic value
ODFW	Oregon Department of Fish and Wildlife
OHRC	Oregon Hatchery Research Center
PS	personal services
REI	regional economic impacts
SAR	smolt to Oregon fisheries catch rate
STEP	salmon trout enhancement program
SS	supplies and services
TRG	The Research Group, LLC
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WTP	willingness to pay

State Owned Hatchery Economic Analysis LOOKING AHEAD: Charting a Sustainable Future for Oregon's Hatchery System Project

Executive Summary

Introduction

The 2023 Oregon Legislature instructed the Oregon Department of Fish and Wildlife to review the State owned hatchery system. This economic analysis study report will be synthesized and combined with other reports from third-party contractors retained to participate in the review. The synthesized report is due for Legislature presentation in the Spring 2025.

ODFW operates 33 fish hatcheries statewide. Of those, 14 are considered State owned hatcheries. The others are 18 federal owned hatcheries and one Portland General Electric owned hatchery. All hatcheries total releases in 2023 were 44.1 million of which 5.3 million are resident species such as trout and kokanee. State hatcheries releases in 2023 were 8.4 million anadromous and 3.8 million resident species. State hatchery objectives are for fisheries enhancement with a few instances of programs for mitigation and stock recovery. The other hatcheries that ODFW operates include multiple objectives for fishery augmentation, dam mitigation for the loss of fish habitat, and stock conservation (supplementation and restoration).

The economic analysis is to provide information for informed decision making concerning the future management of State owned hatcheries. The scope of the analysis was restricted to addressing the direct use economic net benefits from hatchery production and cost of operations. This restriction omits the effects that science continues to show concerning potential adverse impacts to wild fish stocks. There may as well also be positive conservation effects depending on hatchery production objectives such as restoring the productivity of natural populations, nutrient cycling, and reducing the demographic risk of expiration in severely depleted stocks. Regardless, it is recognized enhancement hatcheries have social and economic benefits from preserving fishable stocks, community economic development from hatchery spending, contributions to tribal interests, and the provision of education opportunities. Other ecological economic research is necessary to develop more in-depth economic and environmental review encompassing an ecosystem and biodiversity frame of reference.

Methods were used to allocate accounting cost centers to fish species production to better understand the State hatcheries benefits. Allocation methods were necessary because hatchery accounting does not always track internal operation costs at the species level. The modeling was done at the individual hatchery level to learn about operation cost effectiveness.

Modeled economic measurements are for a number of quantifications. Direct value (DV) was estimated for commercial harvest revenue and spending from recreational angling and hatchery

visitor trips. Cost effectiveness analysis (CEA) calculations are cost per release, cost per production pound and cost per harvested adult. Economic benefit estimates for active uses of fish production are provided with measurements for regional economic impacts (REI) and net economic value (NEV). REI considers the economic contributions from fishing, visitor trips, and hatchery operation. REI is expressed as labor income including the multiplier effect, job equivalents, and State/local taxes generated. NEV is used in a limited benefit-cost analysis (BCA). Passive use and cultural values are discussed in a qualitative manner. A separate report section has descriptions about how hatchery production can affect environmental justice.

The economic analysis was performed under a tight schedule that precluded undertaking beneficiary (fisheries participants and hatchery visitors) surveys. Therefore, literature derived economic ratio estimators were used to translate hatchery production to economic measurements. There are qualifying assumptions that accompany such a benefit transfer approach.

The fisheries economic benefit measures were only for Oregon fisheries since future management decisions will be driven by those effects. This omits the economic effects accruing to economies in Alaska, British Columbia and Washington from large fisheries harvests of anadromous species with Oregon hatchery origin. For example, north Oregon Coast fall Chinook stocks total catch is 55 percent in non-Oregon fisheries. If a future study was inclusive of benefits to external economies, it would be of interest to show impacts to Oregon's economy from non-Oregon origin stocks.

Economic value calculations are reduced to per fish units and then associated with harvested adults. The harvested adults are "attributed" meaning they are a share of the total harvests credited to the rearing (partial or entire) hatchery. The share factor is the participating hatchery rearing time divided by the total rearing time at release. It is typical that fish at various growth stages are transferred to other hatcheries and to remote acclimation facilities. The share factor purpose is to not inflate benefits accruing to State hatcheries when partial rearing is occurring. Another perspective is that the fish would not have been produced without at least partial involvement of a hatchery. Therefore, using attributed harvests results in conservative estimates of economic value.

The analysis did not investigate alternative production scenarios other than status quo operations. This is despite acknowledgment that tradeoff analysis for attaining hatchery fisheries enhancement objectives in other manners (such as through habitat improvements, different fishery management regimes, etc.) is of interest. There would have to be an extension to this study's modeling to assess the economic value changes to wild stocks and other influences on hatchery fish release survival (such as climate driven environmental conditions).

The focused approach to the analysis left out some hatchery economic effects that deserved attention. These include fish provided to food banks, hatchery operation volunteers, salmon trout enhancement program (STEP), harvests from hatchery participation in conservation programs (for example stock supplementation, species restoration and stream enrichment using

surplus carcasses), and increased fishing opportunities from recycling spring Chinook and steelhead. Although there is significant offsetting economic value in these examples and other related activities, the study workscope did not include examining their economic benefits and costs.

A review of hatchery budget revenue sources and cost trends raised questions about State hatchery operation financial stability. This led to discussions about Oregon funding and how financial support can be more closely linked to hatchery beneficiaries. A cursory review of example financing techniques was provided.

There are model design and study report organization details that need noting. State hatchery financial portrayal is a one-year model for 2023 revenues and costs. The one-year model is a stylized but reasonable representation of current hatchery production and economic activity. There is added information about real production cost and revenue indicator trends. When individual hatcheries are identified in the report narrative and displays, the list number will be less. The Wizard and Falls Creek hatcheries are separate facilities but are managed as one hence the hatchery list number being 13. The Rock Creek Hatchery was extensively damaged by a wildfire in 2020 and has not operated since then. It is included as a studied hatchery using projected budgets and production levels based on previous hatchery operations and objectives.

Hatchery Costs

The State hatcheries annualized budget (excluding annual capital contributions) during the biennium was \$12.5 million. When capital contributions are included, the annual budgets sum to \$16.4 million. About 22 percent of the supporting revenues are from the State general fund, 51 percent from license fees, 25 percent from federal programs such as the Sport Fishing Restoration Fund and two percent are from other external sources.

State hatchery cost categories are for variable (about 57 percent of total costs) and fixed costs (43 percent). The variable costs for operations (50 percent) include personal services, feed, utilities, travel, and other. The variable costs for support services (seven percent) includes fish health, CWT/marketing, and fish liberation. The fixed costs include headquarter administration (two percent), field management (one percent), heavy maintenance (six percent) and bond expenses (three percent). The bond expenses are from each hatchery's contribution to a \$10 million deferred maintenance/catastrophe bond fund. The \$10 million bond fund was a one-time allotment. Funds were used for hatchery improvements over a five-year period. Wildfire payments (seven percent) are insurance premium payments required at Klamath (\$260,000) and Rock Creek (\$900,000) hatcheries. The insurance premiums are due to insurance company settlement for paying wildfire damages at the two hatcheries. Capital costs (24 percent) are expressed as existing facilities annual depreciation and for annualized replacement costs. Existing facilities are generally considered fully depreciated. Annual replacement costs are based on a straight-line method, 70-year useful life, and 25 percent salvage value.

Cost trends over the last three biennia shows nominal increases in spending, but it appears the spending has not kept up with increasing production costs. At static or decreased budget revenues combined with constant production schedules, a financing collision occurs. It will be necessary to increase revenues, adjust production levels, accomplish efficiencies, or a combination. Other State hatchery review contractors are addressing efficiencies. Shifting revenue sources and amounts are discussed in this report as part of the sustainable funding topic.

Cost Effectiveness Analysis

Hatchery production CEA indicators by species are shown on Table ES.1. Rearing costs are highly dependent on time spent at hatcheries. Steelhead cost per release can be three times salmon releases due to the rearing time differential. Cost per facility pound reflects the size of fish at the time of transfer out of State hatchery rearing and/or size at release. Cost per harvested adult is a translation of releases times a smolt to Oregon fisheries catch rate. Hatchery production fisheries effective SAR by species are shown in Table ES.2. (The effective rate will be less than actual SAR because its calculation is based on attributed catch.) The SARs brood years and later catch years use multiple periods depending on data availability. There is high variability for SARs across the selected brood and catch years.

The cost per harvested adult has a net benefit perspective. The net benefit statistic can be a comparative efficiency indicator for other means to increase fishing opportunities (spawning habitat improvements, predation removal programs, resolving migration route impediments, etc.). Using statistics for comparative purposes will often have time horizon complexities where the other means will take several fish generations to reach capacity production levels. The net benefit statistic used for that type of evaluation was not addressed in this economic analysis study.

Regional Economic Impacts

The study's REI model translates benefiter and hatchery operation spending into measurements of economic effects within study adopted economies. Using existing secondary industry input-output relationship models, the initial spending is tracked for respending until the money leaks out from the study economies. The measurements for the economic effects from the initial spending and respending are provided in several metrics including labor income, equivalent jobs and state/local taxes generated.

The model inputs for initial spending are characterized by benefiter direct values and the previously described hatchery costs. The State hatchery summed direct values for fisheries are \$0.4 million commercial harvest value, \$62.3 million recreation spending, and \$6.5 million visitor spending. These direct values represent commercial fisheries 166 thousand pounds anadromous species catch, 659 thousand recreational fishing angler days, and 169 thousand visitor days.

Selective spending categories for hatchery costs are used in the REI calculations. For example, the local economy REI does not include headquarter costs. The local and statewide REI does not include capital contribution estimates. Annual capital contributions would be properly included when construction spending actually occurs.

The REI model results are shown on Table ES.3 and Figure ES.1. Total REI for State hatchery economic effects are \$55.5 million labor income which is equivalent to 1,100 jobs in the state level economy. State/local taxes associated with this economic activity are \$6.0 million. Federal taxes would be in addition to this amount. Trout fisheries contribute about 46 percent of the REI, followed by anadromous species fisheries (25 percent), hatchery operations (20 percent) and hatchery visitors (nine percent). State hatcheries anadromous commercial fisheries REI is a small contributor to Oregon total ocean and freshwater fisheries. Oregon commercial salmon troll and net fisheries REI in 2021 is \$11.6 million labor income (2023 dollars). Study results show modeled REI from Oregon hatcheries contributions from commercial fisheries in 2023 are \$0.7 million income or a six percent share. The two years are incongruous, but the comparison give a picture of the relative share that State hatchery production contributes to the State's commercial salmon fishing industry.

Net Benefits

The REI measures the value of hatchery production through the financial activity that is associated with active benefiteres and hatchery operations spending. A second way to measure hatchery production economic value is to account for extra value people and business are willing to pay (WTP) for the fish. The extra value is what people expect that a product or activity they spend money on will be worth at least as much, and probably more to them, than what they spend to procure it. NEV is the difference between WTP and what would be actually spent. WTP for recreational fisheries has to come from survey information. The WTP from commercial fisheries can be the profit from the connected businesses in harvesting, primary processing, guiding, and other businesses. Those estimates can be made without surveying if enough is known about those businesses finances. For this economic analysis study, NEV on a per unit basis (days for recreational anglers and harvest pounds for commercial businesses) was taken from literature.

The calculation of net benefits from hatchery production is the result from a limited BCA. The calculation for this study is simply NEV minus hatchery costs. It is expressed in absolute values and as ratio of NEV to hatchery costs. A positive absolute value and a ratio greater than one will mean the NEV is more than the costs. Using a BCA approach has many advantages for dealing with the time dimension for providing hatchery services and even accounting for other ecosystem values and opportunity costs. However, assigned study scope precluded the additional complexity.

Hatchery net benefits from fisheries and visitors are shown on Table ES.4. The benefit-cost ratio is positive for all species except summer steelhead at 0.83. Trout fisheries have the highest ratio at 6.33. Table ES.5 shows the ratio for individual hatcheries. All hatcheries are positive and

range from the lowest Elk River (1.21) closely followed by Salmon River at 1.22 to highest Roaring River (10.61). In general, the hatcheries with the higher proportion of trout production had higher benefit-cost ratios. There is also a strong relationship between net benefits and cost per pound at these facilities, with larger facilities having lower costs per pound and smaller facilities having higher cost per pound.

Study results show the net benefit sensitivity to SARs. For the example summer steelhead, it would be necessary for the SAR to increase about 20.0 percent to make net benefits zero.

Passive Use and Cultural Value

Passive uses pertain to the existence of the fish resource including provisions for the option to use the resource (option value), maintaining the resource for future generations (bequest value), and believing fish should be abundant so that others can benefit (altruistic value). Measuring these values is complex and their abstract nature makes them difficult to understand, thus it is more troublesome to incorporate them into policy making decisions.

Economists have defined and occasionally measured existence values associated with the simple presence of a fish population. The value is reckoned as the amount that people would be willing to pay (WTP) to assure the existence of a fish stock, or to pay for a specified increase in the fish stock. One study in 1999 found that the typical Washington household WTP \$203 (2023 dollars) for a 50 percent increase in migratory fish populations. This represents the value held by households that do not fish and households that do fish. With a total of two million households holding such values at the time of the survey, the overall value per fish is a remarkable \$458 (2023 dollars). This estimate pertains to a rather broad class of fish including all hatchery and wild origin stocks in the Columbia Basin.

The passive use values, no matter how tenuous the value determinations, are important for bringing into perspective the total value of fish resources. The passive use value measurement usually always dwarfs active use values. It is incumbent on the presenter of the measurement to explain the measurement's applicability, including it not being additive with other measures. Policy discussions about continuing or just refining hatchery practices whose purpose is to support fisheries need to consider society's comparative importance on the continued existence of those fish resources.

Many tribes live and fish in Oregon. Anadromous fish species and resident fish are interconnected with tribal culture and have been since time immemorial. Some of the federally recognized tribes in the analysis area are party to treaties with the US that reserve tribes fishing rights. The US has Indian trust responsibility for all tribes whether or not there are treaties. Trust responsibilities are fiduciary obligations to protect tribal lands, assets, and resources. Several tribes have recently signed memorandums of agreement to advance the government-to-government relationships between those tribes and the State of Oregon and enhance tribal sovereignty. In regards to tribal impacts, the provision of hatchery fish can be a welcome

substitute for degraded wild stocks but continued adverse impacts to wild stock recovery is a tribal concern.

Distribution of fish from hatchery programs with tribal involvement is directly affected by levels of hatchery production. Changes to hatchery production as well as changes in environmental conditions could possibly reduce the number of hatchery-origin salmon and steelhead available for tribal benefits.

All tribes in the analysis area could be impacted by changes in hatchery production. However, assessing these impacts from an environmental justice perspective would require input and information from those tribes and investigating is beyond the scope of this analysis.

This study is an economic analysis about status quo conditions, but if there was change in hatchery practices then environmental justice impacts would be a consideration. As such, an analysis area was chosen and relevant socio-economic characteristics were compiled. The chosen analysis area was the counties where State hatcheries are located. Discussions are provided about how hatchery practices might have harm and benefits in the identified communities. The impact categories discussed are how hatcheries contribute to employment, food subsistence and fish as a traditional cultural resource.

Discussions are provided using related socioeconomic measures. Example measures are whether any of the hatcheries are located in counties determined to be minority (Native American or Hispanic) or low-income (families below poverty level) using data for percent minority, poverty rate, or income compared to the State reference area. All of the hatchery located counties meet the test except Clackamas (Clackamas Hatchery) and Deschutes (Fall River Hatchery). Jefferson County where Wizard Falls Hatchery is located has the highest percentage of Native American and Hispanic population, highest rural population and highest incidence of family poverty rate.

It can be assumed some fishing industry participant households are in the lower income levels. Any lessened commercial catch due to lessened hatchery production has the potential to affect those households. The counties where hatcheries are located are rural with per capita income generally lower than statewide. While the jobs at the hatchery are skilled occupations with competitive wage levels, the multiplier effect of these jobs will mean occupations with lower wage levels can be affected. Recreational fishing trips motivated by hatchery fish abundance (expectation of satisfying catch rates) occur in the hatchery located counties. Recreational fishing economic impacts affect jobs in the visitor industry. Those jobs are tiered with lower wage and salary level categories. Lessened hatchery protection will lower angler spending due to less trips. The lowered spending will potentially affect income being received by households of concern.

Hatchery programs distribute some collected fish to food banks or food share organizations. And if requested, will supply fish to tribes for ceremonial and subsistence purposes. The

counties of concern benefit from these program distributions and lessened hatchery production will potentially lower the donations.

In addition to employment and benefiter distributional impacts, there are other hatchery physical issues to consider (water quantity and quality, power use, etc.). Hatchery size and remote location make those attributes of less environmental justice concern if operations stay within hatchery water diversion and discharge state and local permit standards.

Sustainable Funding

The primary purpose of the economic analysis was to show the economic value from enhanced fishing opportunities afforded by State owned hatchery production. A review of hatchery budget revenue sources and cost trends finds a pending financing crunch from decreasing revenues from license and fees and increasing production costs all the while trying to keep constant production levels. A cursory review of example financing techniques is provided. There is a deeper dive into raising revenues through increasing fisheries direct user fees. The financing discussions are brief and are presented without prescriptive actions. It is recommended an all-hatchery financing planning study be undertaken to distinguish alternatives with accompanying social and economic impact analysis to assist decision making about future hatchery management.

Moving towards sustainable hatchery funding will mean not only fiscal adaptation to better balance benefiter funding, but also can mean emphasis that hatchery operation services are being delivered with highest efficiency given trending environmental conditions. Climate change causing new environmental conditions will require planning for changes at facilities and operations. The ODFW will also need to lead in associated government services that affect hatchery objectives like fishery management, habitat protection and helping the State of Oregon attain climate change goals.

Other State hatchery review contractors are addressing facility and operations actions needed for climate change challenges and taking care of deferred maintenance items. This report discusses fiscal adaptation possibilities for hatchery sustainable funding. Discussions include reviewing surrounding states hatchery financing to discern if there is a better financing template. Flows from general fund support is the central issue because of the tradeoff use of those funds for other State government services. Better aligning benefiter support requires looking at mechanisms to better extract equitable payments to financially support hatcheries.

The general fund revenue support for all ODFW managed hatcheries is eight percent and 22 percent for the State owned hatcheries. License and fees revenue support are 13 percent and 52 percent, respectively. The balance of revenue support is federal and other external programs. While use of general funds is justified because fish being produced are a public resource, the direct active use benefitters are mostly an isolated society segment. There is the view that benefitters should have a higher stake in the funding from which their proportion of benefits is being derived. If the payment vehicle is an increase in license and fees used for State

hatchery funding to eliminate the general fund revenue, the total increase for the model year is \$2.7 million assuming all other funding source amounts are constant.

State owned hatcheries primary purpose currently is to enhance Oregon fishing opportunities. To that end, funding should reflect support from those that benefit. Benefiters would include in no particular order: (1) commercial and recreational fishing participants, (2) tribes using fish for C&S, (3) local entities and organizations appreciating the education opportunities and economic development aspects from local hatchery operations, and (4) the public concerned about fish species conservation. Assigning benefiter funding responsibilities would be consistent with the well-established utility principle of cost recovery. This thinking suggests an apportionment of hatchery costs would correspond with benefits received. This would spread support liabilities among direct users (e.g. through licenses and fees) and the public (e.g. through general fund revenue sources). The links to public benefits from enhancement hatchery production is through user caused downstream economic effects (i.e. multiplier effects) and conservation values balanced against adverse impacts to wild stocks. Finding and proposing alternative public share burdens was not tasked for this study and is left for future research.

Tabulation shows how fisheries direct user benefiter liability would be proportioned based on benefits received or associated fisheries production costs. The proportion of benefits received is the before mentioned NEV estimate and the associated production cost is the cost per harvested adult times catch.

Fisheries	Associated Funding Liability	
	Proportion of Benefits Received	Production Costs
Commercial		
Anadromous	0.1%	0.1%
Recreation		
Anadromous	33.1%	59.7%
Trout	66.8%	40.1%

The proportion shows the high recreation fisheries participants liability singular responsibilities. An issue is the overlapping participation in the two fisheries.

Trout fishing is pervasive across the state. The most obvious mechanism would be a surcharge on an angling license although other possibilities exist such as a new harvest tag. The additional cost design would have to consider price elasticity. Angling per capita participation has been on a downward trend in recent years and increased access costs could exacerbate the lessened demand.

Anadromous fisheries are more specialized in gear and fishing modes and more expensive to pursue in trip costs. There are revenue generation mechanisms that could target the fishery such as harvest tag possession requirements to avoid penalizing non-anadromous participants.

Report discussion for sustainable funding does not address an equitable assignment of total hatchery costs among all beneficiaries. The discussion only addresses how fisheries beneficiary revenue generation mechanisms might compensate for decreased general fund revenue dependency. Different mechanisms to secure the increased funds from commercial and recreational participants would need to be investigated and vetted by stakeholder groups. Ultimately the mechanism would need Oregon Fish and Wildlife Commission approval and legislative action.

Previously discussed findings show high WTP values per fish and in aggregate. The political will to shift funding burden could rely on those findings, but there will still be stakeholder resistance to raising fees. Beneficiaries are habituated to comparatively low-cost access to fish resources. There will be arguments promulgated that anglers pay in other ways that make their existing share equitable (for example State income taxes, gas taxes, excise taxes on fishing gear and boats, etc.). In the end, there is a significant imbalance between the hatchery production cost per harvested fish and any direct and indirect layered access fee accounting. Taking steps to resolve the imbalance through beneficiary fee increases will further progress for enhancement hatchery sustainable funding.

It was suggested a hatchery financing planning study be undertaken that offers a range of feasible alternatives that are accompanied with social and economic impact analysis. A financing options evaluation matrix was provided with only brief discussion about methods and results. Offering the matrix highlights considerations for implementing the options, but is not a substitute for necessary detailed analysis and impact explanations. More decision making information about option packaging is necessary.

Table ES.1
Hatchery Production Cost Indicators by Species

	Total	Trout	Anadromous Species					Summer Steelhead
			Subtotal	Fall Chinook	Spring/Sum Chinook	Coho	Winter Steelhead	
Cost per release	1.31	1.59	1.17	0.82	0.86	0.70	2.35	3.25
Cost per facility pound	13.64	9.04	20.71	24.44	18.67	21.81	20.95	18.08
Cost per harvested adult	14.50	6.21	137	161	241	73	132	438

Notes: 1. Cost per harvested adult are for attributed catch in Oregon fisheries.

Table ES.2
Hatchery Fisheries Effective Smolt to Oregon Fisheries Catch Rates by Species

	Anadromous Species							
	Total	Trout	Subtotal	Fall Chinook	Spring/Sum Chinook	Coho	Winter Steelhead	Summer Steelhead
Harvested adults (thous. fish)	1,127.4	1,056.2	71.2	9.6	7.0	26.3	25.3	3.0
Target releases (thous. fish)	12,514.5	4,132.0	8,382.6	1,883.1	1,958.7	2,723.8	1,417.4	399.5
Effective SAR		25.56%	0.85%	0.51%	0.36%	0.97%	1.78%	0.74%

- Notes: 1. Harvested adults are attributed catch in Oregon fisheries. The effective SAR calculation for this table is based on the lesser attributed catch, which will be less than actual SAR data that is based on all-hatchery fisheries harvests.
2. SARs mean brood years and later catch years use multiple periods depending on data availability. There is high variability for SARs across the brood and catch years.

Table ES.3
Regional Economic Impact from Fisheries, Hatchery Visitors, and Hatchery Operations

	REI		State/Local
	Labor Income (\$000's)	FTE Jobs	Taxes (\$000's)
Fisheries	39,303	779	4,277
Hatchery visitors	4,909	97	534
Hatchery operations	<u>11,273</u>	<u>223</u>	<u>1,227</u>
Total	55,484	1,100	6,037

- Notes: 1. REI measurement for labor income at the statewide economy level in thousands of 2023 dollars. REI includes the multiplier effect.
2. Jobs are full and part-time equivalent (FTE). The calculation of FTE is assumed to be average annual earnings for Oregon.
3. REI from fisheries are for attributed harvests. Attributed harvests are the portion of catch based on the share of rearing time spent at that hatchery and total rearing time at release. Fisheries are Oregon only.

Table ES.4
Hatchery Net Benefits from Fisheries by Species and Visitors

Species	Cost Base	NEV Attributed Benefits	Net Benefits Cost Base	Benefit-cost Ratio
Trout	6,559	41,531	34,973	6.33
Fall Chinook	1,549	3,205	1,656	2.07
Spring/sum Chinook	1,688	4,768	3,080	2.82
Coho	1,918	2,062	144	1.08
Winter steelhead	3,336	9,480	6,144	2.84
Summer steelhead	1,300	1,083	(217)	0.83
Visitors		4,214	4,214	
Total	16,350	66,344	49,994	4.06

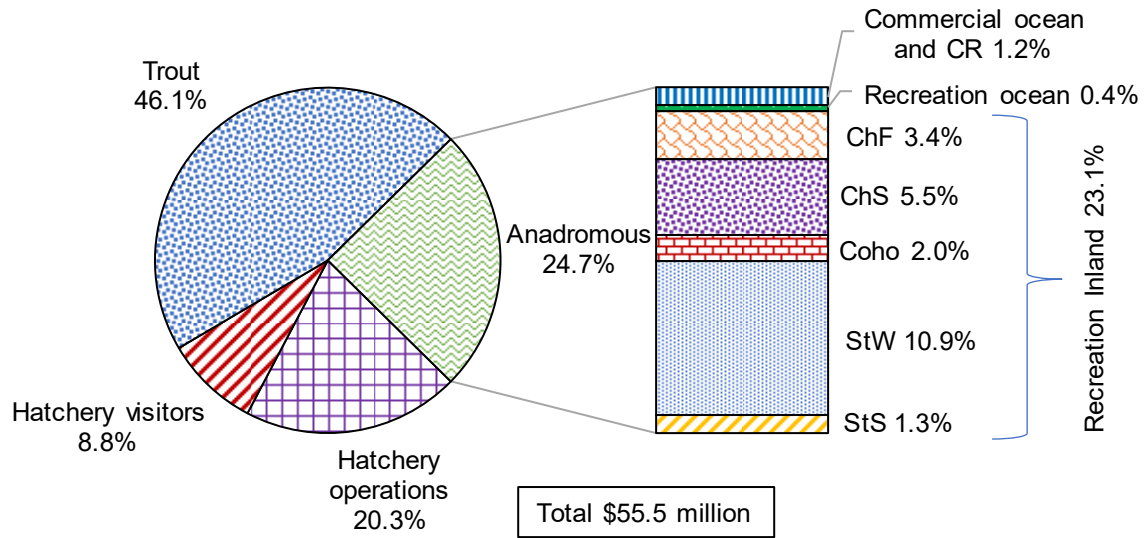
- Notes: 1. Cost, NEV, and net benefits are in thousands.
2. Total net benefits are summed fisheries NEV and visitors NEV minus species allocated hatchery costs. Benefits do not include passive use values.
3. Hatchery cost base includes variable and fixed costs. Fixed costs include annualized capital contributions.

Table ES.5
Individual Hatchery Production, Economic Value, and Net Benefits

Hatchery	Pounds	Releases	Total Cost	Total REI	Total NEV	Net Benefits	Benefit-cost Ratio
Alesea	121,027	437,789	1,297	4,384	5,594	4,297	4.31
Bandon	32,058	979,559	840	1,851	1,705	866	2.03
Cedar Creek	67,678	824,444	1,094	3,812	4,703	3,609	4.30
Clackamas	82,280	3,272,801	1,776	3,884	2,871	1,095	1.62
Elk River	48,079	891,964	1,023	1,659	1,241	218	1.21
Klamath	108,757	396,734	1,154	3,742	4,689	3,535	4.06
Nehalem	70,931	371,012	971	2,416	2,568	1,597	2.64
Oak Springs	198,103	1,112,919	1,465	7,985	10,969	9,504	7.49
Roaring River	220,065	906,823	1,301	9,842	13,808	12,507	10.61
Salmon River	39,550	482,331	1,055	1,713	1,289	234	1.22
Trask	26,968	640,614	874	3,066	3,565	2,691	4.08
Wizard/Falls River	97,034	1,570,956	1,393	8,332	9,986	8,593	7.17
Rock Creek	<u>85,717</u>	<u>626,589</u>	<u>2,107</u>	<u>2,800</u>	<u>3,355</u>	<u>1,248</u>	1.59
Total	1,198,247	12,514,538	16,350	55,484	66,344	49,994	4.06

- Notes: 1. Cost, REI, NEV, and net benefits are in thousands of 2023 dollars.
2. Total REI includes fisheries, hatchery visitor, and hatchery operations. The REI measurement is labor income at the statewide economy level.
3. NEV includes values for active uses (fisheries and visitors). It does not include passive use values.
4. Rock Creek Hatchery visitor count is based on activity prior to wildfire damage closure.

Figure ES.1
 Regional Economic Impact from Ocean and Freshwater
 Fisheries, Hatchery Visitors, and Hatchery Operations



- Notes: 1. REI measurement for labor income at the statewide economy level in millions of 2023 dollars.
 2. Acronyms are ChF - fall Chinook, ChS - spring Chinook, StW - winter steelhead, and StS - summer steelhead.

I. Introduction

The Oregon Legislature directed the Oregon Department of Fish and Wildlife (ODFW) to provide a third-party assessment of the operations, sustainability, and climate vulnerability of State owned hatcheries.¹ The ODFW operates 33 fish hatcheries statewide. Of those, 14 are considered State owned hatcheries.² (See Map I.1 for their location and relative production size.) The others are 18 federal owned hatcheries and one Portland General Electric owned hatchery. This report provides investigative results for one of the legislative directions topics to complete a State hatcheries economic analysis.³

State hatchery objectives are for fisheries enhancement with a few instances of programs for mitigation and species restoration. The other hatcheries that ODFW operates include multiple objectives for fishery augmentation, dam mitigation for the loss of fish habitat and conservation (supplementation and species restoration).⁴

All-hatcheries total releases in 2023 were 44.1 million of which 5.3 million are resident fish such as rainbow trout and kokanee (ODFW May 2024). State hatcheries releases in 2023 were 8.4 million anadromous and 3.8 million resident species.⁵ A broadbrush estimate of regional economic impact shows Oregon all hatchery fisheries contribute \$350 million labor income (2023 dollars) to the State economy.⁶ There are many caveats to this broadbrush estimate, but clearly shows that ODFW managed hatchery production is an important contributor to the State economy.

¹ The directions are contained in Senate Bill 5506 passed in the Oregon 2023 Legislative Session as a budget note within ODFW 2023-2025 biennium budget.

² Wizard Falls Hatchery and Fall River Hatchery were combined in the economic analysis and are referred to as Wizard/Falls River in tables and figures.

³ The Rock Creek Hatchery was extensively damaged by a wildfire in 2020 and has not operated since then. It is included as a studied hatchery using projected budgets based on previous hatchery operations and objectives.

⁴ Even with State hatcheries primary objective being fisheries enhancement, there are biological benefits from artificial production for reducing the demographic risk of extirpation in severely depleted stocks. A concern in addition to hatchery origin fish density effects (food competition, disease, etc.) is genomic alteration of hatchery fish for introgression (loss of fitness) and integrity (spawning reproduction). Anderson et al. (January 2020) recounts mixed results in literature about multi-generational hatchery effects. Dayan et al. (2024) presents experimental evidence fitness characteristics are not lost in one example hatchery origin fish.

⁵ The releases are actual releases as reported in ODFW (May 2024) which can differ from planned target production. This study 2023 model uses target releases for each State hatchery.

⁶ Oregon sportfishing freshwater trips for trout and anadromous species compared to trips for any species was about 90 percent in 2008 (Runyan 2009). Saltwater trips for anadromous species were about one-third. An estimate of sportfishing regional economic impacts in Oregon is \$415 million labor income (\$498 million 2023 dollars) for freshwater and \$99 million labor income (\$119 2023 dollars) for saltwater in 2018 (ASA 2020). Summing over trout and anadromous species, regional economic impacts would be \$487 million labor income (2023 dollars). The TRG (June 2024) estimates commercial (net and troll) salmon economic impacts in Oregon fisheries to be \$12 million in 2021 (\$13 million 2023 dollars). Four Peaks (August 2024) estimated anadromous species catch was 70 percent hatchery origin. If it is assumed the share is uniform across all anadromous and resident fish fisheries (which it is probably not) and fish numbers are a predictor of the spending that generates the economic impacts (which they are probably not), then using the disparate study result would imply Oregon hatchery origin fish generate \$350 million income (includes multiplier effect).

Elk River Hatchery raceway.



Photo credit Oregon Department of Fish and Wildlife.

The purpose for the economic analysis is to provide information for informed decision making concerning the future management of the State hatchery system. The scope of the analysis was restricted to addressing the positive economic benefits from hatchery production and operations. This restriction omits the minuses that science continues to show concerning adverse impacts on wild fish stocks. Regardless, it is recognized enhancement hatcheries have social and economic benefits from preserving fishable stocks, community economic development from hatchery spending, contributions to tribal interests, and the provision of education opportunities. Other ecological economic research is necessary to develop more in-depth economic and environmental review encompassing an ecosystem and biodiversity frame of reference.

Methods were used to allocate accounting cost centers to fish species production to better understand the State hatcheries benefits. The modeling was done at the individual hatchery level to learn about operation cost effectiveness. Allocation methods were necessary because hatchery accounting does not always track internal operation costs at the species and efficiency indicator level.

Modeled economic measurements are offered for a number of quantifications. Direct value (DV) was estimated for commercial harvest value, recreational angling trip expenditures, and visitor trip spending. Cost effectiveness analysis (CEA) calculations were cost per release, cost per production pound, and cost per Oregon fisheries harvested adult. Economic benefit estimates for active uses of fish production are provided with measurements for regional economic impacts (REI) and net economic value (NEV). REI considers the economic contributions from fishing, visitor trips, and hatchery operation expenditures. REI is expressed as labor income including the multiplier effect and job equivalents. State/local taxes generated are estimated. NEV is used in a limited benefit-cost analysis (BCA). The economic benefit measures were only for Oregon fisheries since future management decisions will be driven by those effects.¹

¹ Anadromous fish ocean migration patterns expose State hatcheries production to non-Oregon based fisheries. Columbia River and northern Oregon Coast anadromous stocks have high capture rates in coastal waters in southeast Alaska, British Columbia and Washington. For example, Oregon Coast northern fall Chinook stocks capture (adjusted to account for several rivers differential harvest rates) in southeast Alaska and British Columbia fisheries is about 55 percent of total catch for 2019 through 2021 (PSC 2023).

State hatchery financial portrayal is a one-year model for 2023 revenues and costs. There is added information about real cost indicator trends, and when combined with information about what is necessary for attaining efficiencies and anticipating climate changes, will assist the State hatchery review project. The one-year model uses annual hatchery costs taken from fiscal year (FY) 2023-2025 budgets somewhat modified by actual expenditures that have occurred during the FY. The modeled benefits are calculated seemingly from one brood cycle associated with hatchery planned production. In reality, there is wide variation in hatchery costs and production, anadromous fish smolt and trout survival and hatchery visitor attendance. There are changes to fisheries management, environmental conditions, hatchery site circumstances, and the general economy. In that sense, the one-year portrayal is a stylization to represent the reasonable representation of hatchery production and economic use activity in any given recent year.¹

The measure for harvested adults is attributed harvests. The measure is the portion of catch based on the share of rearing time spent at that hatchery and total rearing time at release. This accounting is to properly credit the hatcheries with the share of fish production they provide. A different perspective on this assumption would be the fish would not be produced at all if a State hatchery did not provide partial rearing. For that reasoning, harvest estimates would be considered conservative in this report.

A sensitivity assessment was performed for the key variable release-to-harvested adult rate based on accrued net benefits. A more thorough uncertainty analysis approach would have been able to offer probability statistics looking at all model inputs.

The descriptions of all Oregon commercial and recreational salmon and steelhead fisheries refer to data Year 2021. Although Year 2023 catch and harvest value data is available, it was decided the fishing conditions were not representative of recent years (TRG June 2024). The ocean troll salmon fishery off the central and southern Oregon Coast was closed in 2023 except for a late September and October season. Landings from north of Cape Falcon catch areas were allowed but constrained.

The focused approach to the analysis left out some hatchery economic effects that deserved attention.

- Surplus fish are provided to food banks and to tribes for ceremonial and subsistence purposes.
- Hatcheries rely on volunteer help and donations for carrying out propagation work.

¹ Shown tables and figure titles without dates are annual for the model year 2023. Table and figure titles that simply show the word "hatchery" are referencing only State hatcheries. Tables and figures that itemize trout production would include minor production of other resident species such as kokanee.

- A very active salmon trout enhancement program (STEP) manned by volunteers using donated land and facilities.
- There are the conservation related benefits (for example species restoration and stream enrichment using surplus carcasses) from State hatchery operations. While the hatchery costs are included in the economic analysis, any increased wild adult returns contributing to harvests were not included in the model.
- There are few cases where steelhead and spring Chinook have been recycled to enhance fisheries at locations near the returning hatcheries. Although recycling is not treated explicitly in the models presented, it shows promise as a way to increase recreational benefits from hatchery production. The risk of increasing interactions between hatchery and wild fish should also be considered when evaluating recycling as a management tool.

Although there is significant offsetting economic value in these examples and other related activities, the study workscope did not include examining their economic benefits and costs.

Anadromous and resident fish have non-market economic value (sometimes called passive use value) and cultural/spiritual value. Surveys have shown people hold these values knowing that native fish exist and will exist in the future. State hatcheries are related to that value because some hatchery programs include species restoration and hatchery fish can provide substitute fisheries to allow native fish escapement to natural habitat.

Tribes have a special relationship linked to fish resources. The cultures, inter-tribal economic interactions, and religions of tribes are all impacted and influenced by fish. State hatcheries provide tribal harvesting opportunities and ensure species survival. Changes in hatchery production have the potential to affect the extent of harvests available for tribes and minority and low-income populations. Environmental justice objectives are to minimize disproportionate impacts to communities traditionally underrepresented in public processes. Qualitative discussions of passive use values, tribal values, and environmental justice are offered.

Discussions are also provided for current funding for the State hatcheries. Review of hatchery funding models in neighboring states is provided as background information. Discussions are offered for different approaches to fund operations and capital improvements. The approaches more closely link hatchery benefiteres to funding sources.

The economic analysis was performed under a tight schedule that precluded undertaking benefiter (fisheries participants and hatchery visitors) surveys. Therefore, literature derived economic ratio estimators were used to translate hatchery production to economic measurements. Literature does not always separate catch rates and economic value per fish in hatchery and non-selective fisheries. It is assumed the provided rates apply equally to both fish origins. The challenges for applying borrowed estimators in a different time and space is discussed by Ready and Navrud (2005) and Newbold et al. (March 2018).

Provenance for the economic analysis model borrowed estimators and data inputs are shown in Table I.1. Appendix A contains the model inputs per unit values.

Economic analysis results and interpretations put into context a "with" and "without" scenario for hatchery production effects. However, a more realistic public policy scenario would not be as simple as what might occur if hatcheries production was abandoned. Hatchery production is politically viewed as a viable replacement for lost natural production; scenarios for modifying production levels and practices would be more likely. The study results could be used to characterize the modifications based on incremental findings, such as a particular stock's average regional economic impacts per release, when the weakness of that characterization is admitted.¹

Additional investigations on tradeoffs and covariate examinations could be done using economics to determine the extent of impacts and benefiter winners and losers. For example, (1) effects from hatchery practices and production levels that might be changed to reduce impacts to natural production (Flagg 2015, McMillan et al. October 2023), (2) changing harvest management to compensate for lost hatchery production, and (3) prediction of climate effects. Such economic investigations requiring an extension of this report's modeling is left to future research.

The contents of this report's *Chapter II* address facilities and operations. Cost effectiveness indicators are provided in *Chapter III*. *Chapter IV* presents the regional economic impact modeling results in local and statewide economies. Benefit-cost analysis applied to species and individual hatcheries are explained in *Chapter V*. *Chapter VI* provides a review of passive use, cultural use values, and environmental justice effects. *Chapter VII* has explanations for hatchery sustainable funding techniques.

There are three appendices. *Appendix A* contains tables showing the economic analysis model inputs. It also has a table showing the social indicators for all Oregon counties that were used in the environmental justice review. *Appendix B* has information about the hatchery target release numbers and rearing practices, details about hatchery budgets, and treatment of hatchery capital costs. *Appendix C* contains surrounding states hatchery location maps and budgets.

¹ Model results are averages for status quo conditions rather than marginal results. The latter should be used in impact analysis. (Impact analysis, for example, would determine economic effects from changed hatchery practices.) Impact inferences can be made for incremental changes using per unit averages, but they will be biased and not necessarily represent the economic effects. There is large variability in model inputs such as the adopted average smolt to Oregon fisheries catch rates (SARs). Relying on statistical averages masks the descriptive ranges that may occur in actual production and realized benefits. The methods scale large economic activities, such as overall commercial and recreational fisheries, to a small subset of the activities. The scaling may or may not reflect true representation of the subject subset.

Map I.1
 State Owned Hatcheries Operated by the Oregon Department of Fish and Wildlife

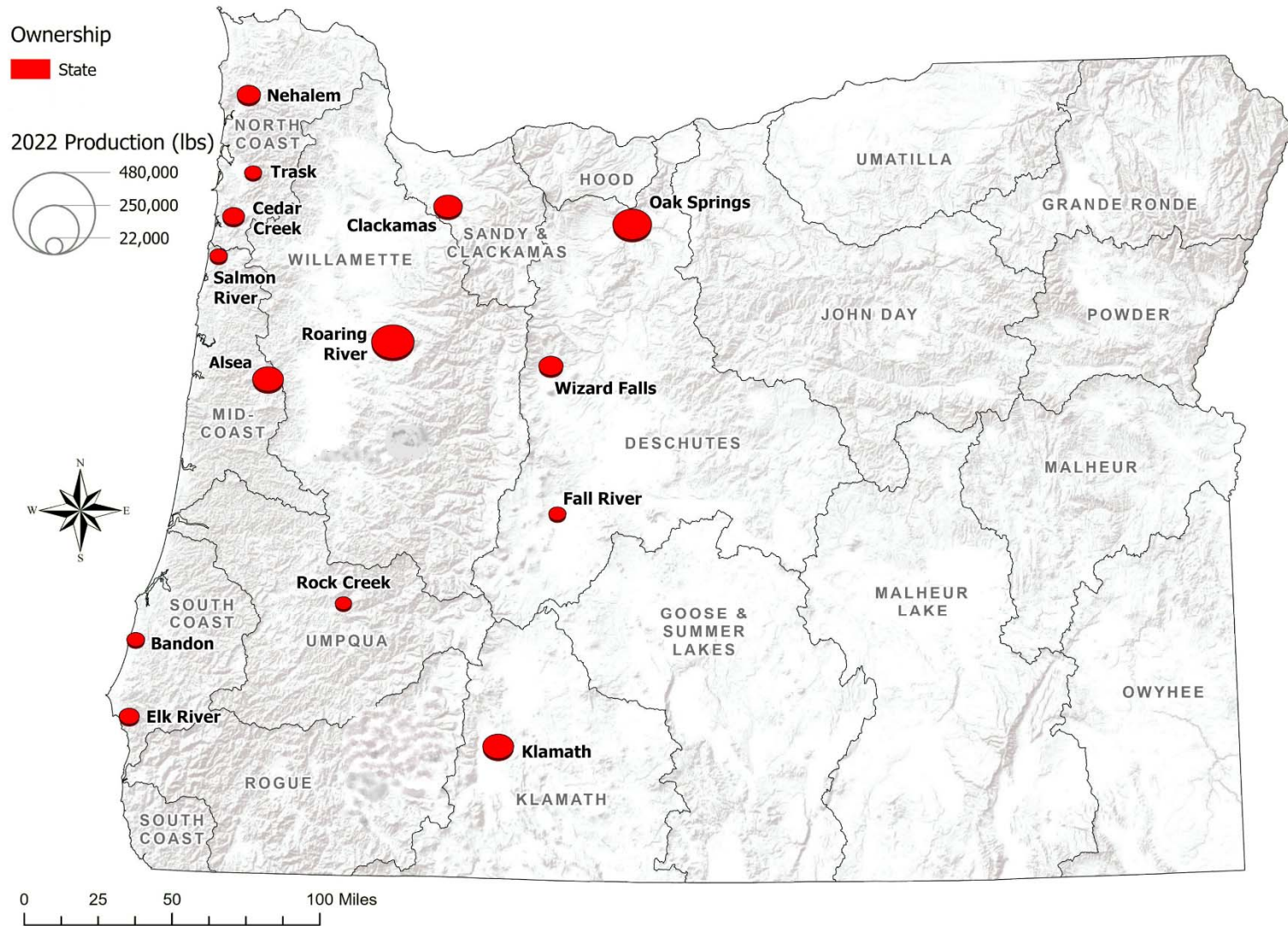


Table I.1
Provenance for Data and Economic Use Values

Annualized Costs

- [1] Replacement: Scott Patterson, ODFW (August 2024)
- [2] Operation: Scott Patterson, ODFW (July 2024)

Production

- [3] Facility releases: HPMP's (2024), audited by Chris Lorion (August 2024)
- [4] Facility pounds: Garza and Kent, ODFW (May 2024)

Catch Per Unit Effort (CPUE) and Smolt to Oregon Fisheries Catch Rate (SAR)

- [5] Trout CPUE: Upton (January 2006)
- [6] Anadromous ocean CPUE: PFMC (February 2024)
- [7] Anadromous inland CPUE: TRG (June 2024)
- [8] Anadromous Columbia River CPUE: TRG (November 2014)
- [9] SARs: Chris Lorion (May, July, and August 2024)

Translations

- [10] Anadromous ocean harvested fish per pound: PFMC (February 2024)
- [11] Anadromous Columbia River harvested fish per pound: TRG (November 2014)
- [12] Rearing time fish life stage and growth size: Chris Lorion and Scott Patterson (June 2024)
- [13] Real dollar year: Gross Domestic Product Implicit Price Deflator (GDPIPD) developed by U.S. BEA
- [14] State-to-local coastwide adjustment factor: BEA Rims II data year 2021 local and Oregon models
- [15] Oregon and coastwide net earnings per job in 2021, and population trends: BEA (January 2024)
- [16] Tax generation: Oregon Legislative Revenue Office (February 2023)

Regional Economic Impact (REI)

- [17] Recreational ocean REI per day: PFMC (February 2024)
- [18] Commercial troll REI per pound: TRG (June 2024)
- [19] Commercial Columbia River price per pound: TRG (June 2024)
- [20] Commercial and recreational Columbia River REI per fish: TRG (November 2014)
- [21] Recreational salmon/steelhead inland REI per day: TRG (June 2024)
- [22] Trout REI per day: Upton (January 2006); \$34.56 in 2001 dollars
- [23] Visitor REI per day: Mojica et al. (January 2021); \$49.54 in 2019 dollars
- [24] Operations spending: BEA Rims II data year 2021 local and Oregon models
- [25] Commercial troll multipliers: IO-PAC economy response coefficients from NWFSC

Net Economic Value (NEV)

- [26] Commercial harvesting and primary processing profitability: TRG (June 2024), Kitts et al. (May 2022), FEAM budgets
- [27] Recreational salmon/steelhead fishing: Rosenberger (November 2018); \$81.37 NEV per day in 2018 dollars
- [28] Recreational trout fishing: USFWS (January 2016); \$69 NEV per day in 2011
- [29] Visitor: Rosenberger (November 2018); \$41.83 NEV per day in 2018 dollars

Passive Use Values and Environmental Justice

- [30] Layton et al. (1999)
- [31] Social and demographic: Census Bureau American Community Survey (ACS) 5-Year Estimates
- [32] Rural population: The Ford Family Foundation and OSU Extension Service (August 2023)
- [33] Commercial salmon landings: TRG (June 2024)
- [34] Recreational ocean salmon trips: PFMC (February 2024)
- [35] Recreational fishing expenditures: Dean Runyan Associates (May 2009)

Direct Values (DV)

- [36] Recreational fisheries expenditures to REI ratio, anadromous: Lovell et al. (2020)
- [37] Recreational fisheries expenditures to REI ratio, trout: TRG (1991)
- [38] Commercial fisheries ex-vessel value to REI ratio, ocean: TRG (June 2024)
- [39] Commercial fisheries ex-vessel value to REI ratio, Columbia River: TRG (November 2014)
- [40] Visitor expenditures to REI ratio: Mojica et al. (January 2021)

Surrounding States Financing

- [41] WDFW, CDFW, and IDFG personal communication (September 2024)

II. Facilities and Operations

State hatcheries are characterized by their recent operation and capital costs, planned releases (numbers and pounds), and predicted harvests resulting from the releases for the model year. Operation cost (nominal and real dollars) trend indicators are provided and interpreted. Hatchery physical descriptions and operation details can be found in ODFW HPMP (various dates 2024) and the project's other hatchery review contractor reports.

A. Production Costs

An annualized budget for all 33 ODFW operated hatcheries during the FY 2023-2025 biennium was \$44.2 million (see Table II.1 for sources of funds).¹ Hatcheries represent close to one-third of ODFW total budget (ODFW October 2023a). The 14 State hatcheries annualized budget (excluding depreciation and capital contributions) during the biennium was \$12.5 million (see Table II.2 for sources of funds). When capital contribution costs are included, the annual budgets sum to \$16.3 million. About 22 percent of the supporting revenues are from the general fund, 52 percent from other funds including licenses and fees, 25 percent federal fund including the Sport Fishing Restoration Fund and 2 percent are from external sources.

State hatchery cost categories shown on Table II.4 are for variable (about 57 percent of total costs) and fixed (43 percent) costs. The variable costs for operations (50 percent) include personal services, feed, utilities, travel, and other. The variable costs for support services (seven percent) include fish health, CWT/marketing, and fish liberation. Liberation costs include hauling truck costs. Labor costs for liberation is included in operations. The fixed costs categories are headquarter administration (two percent), field management (one percent), heavy maintenance (six percent), and bond expenses (three percent). Headquarter administration includes policy making, report preparation, financial/budgeting accounting, monitoring, permitting, and other duties. Field management includes hatchery coordination. Maintenance (heavy) includes

Oak Springs Hatchery site.



Photo credit Oregon Department of Fish and Wildlife.

¹ The shown budgets in this report will slightly deviate from the Departments Legislatively Approved Budget because the numbers will reflect actual revenues and expenditures that have happened during the biennium.

housing costs, spending from emergency contingency and R&E funds for improvements and upkeep. Bond expenses are from each hatchery's contribution to maintaining a \$10 million deferred maintenance/catastrophe bond fund. Wildfire payments (seven percent) are insurance premiums required at the Klamath (\$260,000) and Rock Creek (\$900,000) hatcheries. The insurance premiums are due to insurance company settlement for paying wildfire damages.

Hatchery cost accounting should reflect the long-term nature of the facility investments. It is necessarily a judgment whether light or heavy maintenance are investment costs. For this study it was assumed any light or heavy maintenance or improvements are expensed in the chosen study year. Many of the hatcheries were built many years ago at relatively low cost compared to what it would take to replace the facilities with more modern structures/equipment and permitting requirements. It is assumed existing facilities are generally fully depreciated. Hatchery replacement cost estimates were available and were included as an annual capital contribution based on a straight-line method, 70-year useful life, and 25 percent salvage value. Individual State hatchery replacement cost estimates and annual capital contributions are shown on Table II.3. The annualized capital cost contributions are 24 percent of total costs in Table II.4.

State hatchery annual costs allocated by trout and anadromous species is shown on Table II.4. The allocation is based on species rearing time (months) spent at the State hatchery in relation to a hatchery's total rearing time spent on all species. An alternate allocation could have been production pounds in relation to a hatchery's total production pounds. The rearing time modeling assumption should not be a substitute for more detailed species itemized cost accounting. It can be considered a reasonable estimate useful for the economic modeling and efficiency evaluations used in this report.¹

An attributed factor is calculated to determine the harvest that should be associated with a State hatchery. The factor is the share of rearing time (months) that a fish spends at a State hatchery prior to release. For example, if operations are to raise and release a stock from the same hatchery, then that stock's Oregon fisheries catch is 100 percent attributed to the raising hatchery. If the stock is transferred outside of the State hatchery system at a time measured 50 percent growth stage, then 50 percent of the Oregon fisheries benefits are attributed to the early rearing hatchery. The factor should be considered an index of planned production benefits rather than a measure of actual production or capacity benefits.

State individual hatchery production pounds are shown on Table II.5. All of the hatcheries are actual three-year annual average 2021-2023 with two exceptions. Clackamas uses a two-year average 2021-2022 and Rock Creek uses the attributed pound definition. The Rock Creek hatchery estimate would apply if the hatchery is rebuilt and becomes operational. The information summarizes the production pound detail by species shown in Table B.3.

¹ It is suggested that a cost accounting procedure design be completed that would give species level production cost information. The design could be carried out in a pilot hatchery setting, then when perfected, added to manager responsibilities at all hatcheries.

State hatchery production pound trends by species for the recent seven years are shown on Figure II.2. The trend has been mostly stable at 1.1 to 1.2 million pounds during the years from 2017 to 2023. The shown production is actual as hatchery operators struggle with challenges in costs, water supplies, disease outbreaks, weather conditions, wildfire damage, etc. when trying to satisfy production goals. The stable trend implies production target goals are fixed. Year-to-year variability would be in response to incidents (disease outbreak, wildfires, weather events, practices accidents, etc.).

Oregon fisheries harvests resulting from State hatchery production are calculated using target releases, SARs, and the attributed factor. Table II.6 shows species summarized State hatcheries attributed harvests, target releases, and effective SARs. Effective SARs are less than model input SAR data because it's based on attributed catch rather than total Oregon fisheries catch. SAR brood years and later catch years are averages over multiple periods depending on data availability. There is high variability for SAR across the brood and catch years. The high variability for trout SAR is whether the release was for put-and-grow management or put-and-take management.¹ Table II.7 shows individual hatchery target releases and attributed catch for anadromous and trout species. Figure II.1 depicts individual hatchery variable, fixed, and capital contribution costs. Table II.6 and Table II.7 information is a tabulation from the details shown on Table B.1.

B. Hatchery Cost Trends

Trend descriptions are provided for State hatchery operation personal services (PS) and supplies and services (SS). A broader look at cost trends would include reviewing the hatchery programs headquarter (coordination, evaluation, etc.) and services (liberation, marking, etc.) costs that are incurred in support of all ODFW operated hatcheries. A hatchery funding indicator trend statistic for angling license and fee revenue generation is included in Chapter VII. The revenue trend shows license and fee per capita revenue is decreasing in recent years.

PS and recurring/special SS costs are shown in Table II.8 and as an index to the 2017-2019 biennium on Figure II.3. PS, recurring SS, and special SS nominal costs increased 9.7 percent, 2.7 percent, and 22.5 percent respectively between 2017-2019 and 2021-2023 biennia. Real costs decreased 6.7 percent, decreased 12.6 percent, and increased 4.2 percent respectively over the same period. Special SS costs for housing maintenance and taking care of other deferred maintenance items as a share of total PS and SS have slightly increased. The nominal and real percent shares for the three biennia chronologically are 5.5, 5.8, and 6.2. Production efficiency

¹ Put-and-grow management is a technique used in waters where reproduction capability is limited but habitat conditions support good growth and survival of juveniles and adults. Releases are usually smaller (e.g. fingerlings) than legal size. Put-and-take management is a technique used in waters that are easily accessible to the general public, where angling demand is high, and where habitat conditions are not necessarily suitable to support a satisfactory fishery. Releases are usually legal and trophy size. Oregon Trout Management Policy Guidelines state stocking should be in situations where 40 percent of yearling rainbow plants are caught (OAR 635-500-0105(4)(b)).

indicator (total PS/SS cost per production pound) trend nominal is increasing (efficiency loss), but real is decreasing (efficiency gain).

The index is shown for nominal and real 2023 dollar costs. The dollar adjustment can show whether spending has kept up with price inflation if purchased units (labor, utilities, commodities, etc.) are constant. Production pound trends shown in Figure II.2 are relatively stable over the last three biennia. Given the downward trend of the PS and recurring SS shown in Figure II.3, it appears that while nominal spending has increased, the spending has not kept up with price inflation.

Overall State hatchery expenditures are irregular as the Department compromises operation and maintenance requirements given static funding in order to meet hatchery production goals.¹ The cost trends over the three biennia will change in the 2023-2025 biennium. There will be high wildfire damage related repair and insurance premium costs in future biennia that will be added pressure on hatchery budgeting for same production levels.

Figure II.4 shows fish feed price and purchase trends for State hatcheries. The change in nominal dollars in 2023 compared to the five-year average 2017-2021 is 22.1 percent. The change in real dollars over the same period is 8.7 percent. There has been increasing global aquaculture production in net pen and land based RAS salmon facilities. Supplies for preferred feed mix have lagged meeting the increased demand. Competitive purchasing has raised prices.

The cost trends show hatchery accounting is about managing a financing collision. The collision occurs because of the dynamic nature of spending requirements and the static provision of budget revenues. Aquaculture manufacturing is capital intensive (equipment and buildings are subject to breakdowns) with undependable inputs (feed costs, water quality, utility interruptions, etc.) Budgeted general funds can be firm but license and fees outlook is decreasing and even federal sources can have last minute changes. Production is difficult to throttle short-term to save money in response to the budget vagrancies. Production adaptation and prioritization are necessary at all levels of hatchery administration and management in such financial situations.

¹ There are several accountancy maneuvers available when beginning budget revenues do not materialize or costs exceed budget expectations. For example, the Department can hold hatchery staff vacancies open in order to use PS to cover some of the shortfalls. Another example is using funds in non-hatchery program budgets to make hatchery equipment purchases or facility improvements. Feed is purchased in large lots and sometimes budget SS expenditures do not reflect changes in end-of-year inventories.

Table II.1
Hatchery (All) Funding Sources

Source	FY 2023-25	Annual	Share
General fund /3	6,975	3,488	7.9%
Other Fund License and Fee:	11,735	5,868	13.3%
Other Fund Obligated /4	9,130	4,565	10.3%
Other Fund Dedicated /5	1,088	544	1.2%
BPA	8,422	4,211	9.5%
USCOE	23,960	11,980	27.1%
LSRCP	8,180	4,090	9.3%
MA	12,485	6,242	14.1%
SFR	4,321	2,161	4.9%
PSC, PSMFC, PST, NOAA	<u>2,131</u>	<u>1,065</u>	<u>2.4%</u>
Total	88,428	44,214	100.0%

- Notes: 1. Funding amounts thousands 2023 dollars.
2. Acronyms:
 SAFE - Select Area Fisheries Enhancement Program (Lower Columbia River net pen project)
 PGE - Portland General Electric
 PSMFC - Pacific States Marine Fisheries Commission
 PST - Pacific Salmon Treaty
 NOAA - National Oceanic and Atmospheric Administration Fisheries
 MA – Mitchell Act
 BPA - Bonneville Power Administration
 LSRCP – Lower Snake River Compensation Plan
 USCOE – U.S. Army Corps of Engineers
 COP – City of Portland
 SFR – Sports Fishing Restoration (manufacturers federal excise taxes on sport fishing equipment, import duties on fishing tackle and pleasure boats, and the portion of the gasoline fuel tax attributable to small engines and motorboats)
3. Includes \$1.0 million for hatchery independent resiliency assessments.
4. PGE, Idaho Power, COP, Pacific Corps, Douglas County, Burns Paiute, egg and carcass sales, Wasco Electric-hydro, Cow Creek.
5. SAFE.

Table II.2
Hatchery (State) Budget Revenue Source and Use

Source	Support/		Total	Share
	Operations	Maintenance		
GF	1,426	1,273	2,700	21.7%
OF	3,564	2,856	6,420	51.5%
FF	2,987	141	3,127	25.1%
Other	<u>222</u>		<u>222</u>	<u>1.8%</u>
Total	8,200	4,270	12,469	100.0%

- Notes: 1. Amounts thousands 2023 dollars.
 2. GF General fund
 OF Licenses and fees
 FF Federal fund including Mitchell Act, US Army Corps of Engineers and Sport Fishing Restoration
 Other PGE, Douglas County, hydroelectric sales
 3. See Table B.5 for individual hatchery revenue source and use.

Table II.3
Individual Hatchery Facility Replacement Cost Estimate and Annual Capital Contribution

Hatchery	Replacement		Annual Capital Contribution
	Cost	Depreciation	
Alesea	40,500	--	434
Bandon	13,350	--	143
Cedar Creek	28,040	--	300
Clackamas	32,150	--	344
Elk River	22,020	--	236
Klamath	17,600	--	189
Nehalem	23,330	--	250
Oak Springs	40,000	--	429
Roaring River	29,760	--	319
Salmon River	21,070	--	226
Trask	17,570	--	188
Wizard/Falls River	32,400	--	347
Rock Creek	44,380	--	<u>476</u>
Total	362,170	--	3,880

- Notes: 1. Amounts are thousands 2023 dollars.
 2. Existing investments are assumed to be fully depreciated. Annual capital contributions for each hatchery are calculated using straight-line method, 70-year life, and 25 percent salvage value.

Table II.4
Hatchery Costs by Species

	Cost Category		Species				
	Amount	Share	Trout	Anadromous	Share		
<u>Variable</u>	9,347.5	57%	3,707.5	40%	5,640.0	60%	100%
Operation	8,199.7	50%	3,510.4	43%	4,689.3	57%	100%
Support	1,147.8	7%	197.1	17%	950.7	83%	100%
<u>Fixed</u>	7,002.2	43%	2,851.4	41%	4,150.8	59%	100%
Headquarter	254.4	2%	97.3	38%	157.1	62%	100%
Field management	219.0	1%	90.0	41%	129.0	59%	100%
Maintenance heavy (capital/fixed)	1,048.4	6%	454.8	43%	593.6	57%	100%
Bond expenses	440.0	3%	144.1	33%	295.9	67%	100%
Wildfire payments	1,160.0	7%	410.0	35%	750.0	65%	100%
Annual capital contribution	3,880.4	24%	1,655.2	43%	2,225.2	57%	100%
Total Costs	16,349.7	100%	6,558.9	40%	9,790.8	60%	100%

- Notes: 1. Costs are thousands 2023 dollars.
2. Costs are allocated to species based on individual hatchery rearing time. The allocated costs are then summed over all State hatcheries.

Table II.5
Individual Hatchery Release Pounds

Hatchery	Fish Pounds			
	2021	2022	2023	Average
Alesea	127,996	122,474	112,612	121,027
Bandon	31,242	30,793	34,138	32,058
Cedar Creek	70,343	60,066	72,624	67,678
Clackamas	58,714	105,846	38,511	82,280
Elk River	54,653	47,355	42,228	48,079
Klamath	124,377	94,032	107,863	108,757
Nehalem	74,799	69,932	68,062	70,931
Oak Springs	202,223	177,393	214,693	198,103
Roaring River	235,511	203,615	221,069	220,065
Salmon River	43,443	30,249	44,958	39,550
Trask	31,019	26,576	23,309	26,968
Wizard/Falls River	89,906	103,249	97,947	97,034
Rock Creek				<u>85,717</u>
Total	1,144,226	1,071,580	1,078,014	1,198,247

- Notes: 1. Clackamas fish pounds average is two-year 2021 and 2022. Rock Creek uses attributed pounds.

Table II.6
Hatchery Fisheries Effective Smolt to Oregon Fisheries Catch Rate by Species

	Anadromous Species							
	Total	Trout	Subtotal	Fall	Spring/Sum	Coho	Winter	Summer
				Chinook	Chinook		Steelhead	Steelhead
Harvested adults (thous. fish)	1,127.4	1,056.2	71.2	9.6	7.0	26.3	25.3	3.0
Freshwater	1,123.6	1,056.2	67.4	8.5	6.1	24.6	25.3	3.0
Commercial (Col. R.)	19.7	--	19.7	--	0.1	19.7	--	--
Recreational	1,103.9	1,056.2	47.7	8.5	6.0	4.9	25.3	3.0
Ocean	3.8	--	3.8	1.1	0.9	1.8	--	--
Commercial	1.6	--	1.6	0.7	0.8	0.1	--	--
Recreational	2.3	--	2.3	0.5	0.1	1.7	--	--
Total	1,127.4	1,056.2	71.2	9.6	7.0	26.3	25.3	3.0
Commercial	21.3	--	21.3	0.7	0.9	19.7	--	--
Recreational	1,106.1	1,056.2	49.9	8.9	6.1	6.6	25.3	3.0
Target releases (thous. fish)	12,514.5	4,132.0	8,382.6	1,883.1	1,958.7	2,723.8	1,417.4	399.5
Effective SAR		25.56%	0.85%	0.51%	0.36%	0.97%	1.78%	0.74%
Commercial		--	0.25%	0.04%	0.04%	0.72%	--	--
Recreational		25.56%	0.60%	0.48%	0.31%	0.24%	1.78%	0.74%

- Notes:
1. See Table B.1 for hatchery and stock specific SAR.
 2. Harvested adults are attributed catch in Oregon fisheries. Effective SAR is less than model input SAR data because its based on attributed catch rather than total Oregon fisheries catch.
 3. Columbia River categorized hatcheries include Clackamas, Oak Springs, Roaring River, and Wizard/Falls River.
 4. Elk River Hatchery fall Chinook releases into Garrison Lake are counted as trout and are caught as smolt size with an assumed trout SAR. Oak Springs summer steelhead is released to Haystack Reservoir that has no migration, therefore assumed to have trout SAR.
 5. STEP egg-to-fry program contributions are not tracked for fisheries harvests. Other STEP program releases are tracked for fisheries harvests.

Table II.7
Individual Hatchery Releases and Attributed Catch

Hatchery	Target Releases				Attributed Catch			
	Anadromous		Trout		Anadromous		Trout	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
Alea	281,600	3.4%	156,189	3.8%	5,050	7.1%	89,114	8.4%
Bandon	978,500	11.7%	1,059	0.0%	4,379	6.1%	413	0.0%
Cedar Creek	824,444	9.8%	0	0.0%	8,983	12.6%	0	0.0%
Clackamas	3,272,801	39.0%	0	0.0%	23,611	33.2%	0	0.0%
Elk River	634,727	7.6%	257,237	6.2%	3,250	4.6%	5,075	0.5%
Klamath	0	0.0%	396,734	9.6%	0	0.0%	114,172	10.8%
Nehalem	300,202	3.6%	70,810	1.7%	3,411	4.8%	30,350	2.9%
Oak Springs	153,182	1.8%	959,738	23.2%	1,835	2.6%	264,034	25.0%
Roaring River	150,833	1.8%	755,990	18.3%	1,680	2.4%	326,476	30.9%
Salmon River	463,056	5.5%	19,275	0.5%	4,385	6.2%	8,681	0.8%
Trask	640,614	7.6%	0	0.0%	8,042	11.3%	0	0.0%
Wizard/Falls River	88,889	1.1%	1,482,067	35.9%	0	0.0%	203,083	19.2%
Rock Creek	<u>593,711</u>	<u>7.1%</u>	<u>32,878</u>	<u>0.8%</u>	<u>6,593</u>	<u>9.3%</u>	<u>14,808</u>	<u>1.4%</u>
Total	8,382,560	100.0%	4,131,977	100.0%	71,220	100.0%	1,056,205	100.0%

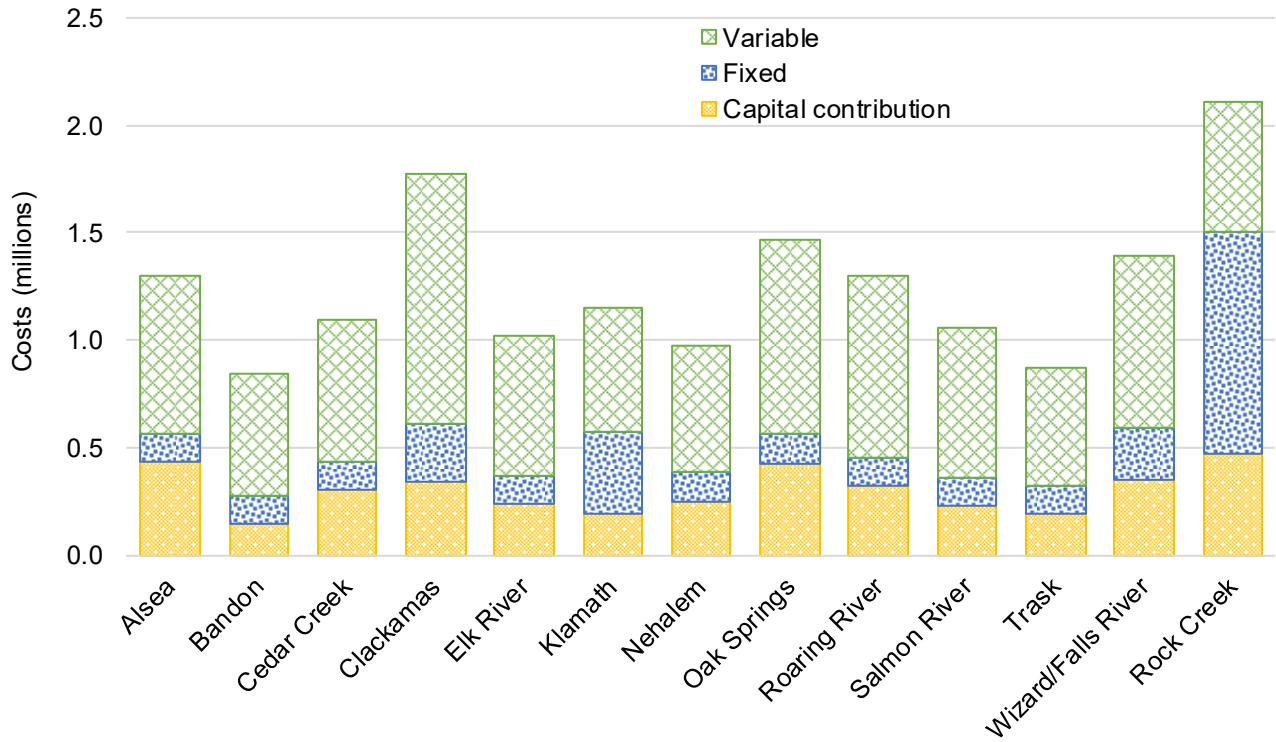
- Notes: 1. See Table B.1 for detailed stock releases and SAR.
2. Catch is attributed harvested adults for Oregon fisheries.

Table II.8
Hatchery Personal Services and Supplies and Services Itemization and
Production Measure in 2017-2019 to 2021-2023 Biennia

	2017-2019		2019-2021		2021-2023		% Change
	Amount	Share	Amount	Share	Amount	Share	2017-2019 to 2021-2023
<u>Nominal dollars</u>							
PS	9,952	67.3%	10,281	68.4%	10,920	68.0%	9.7%
Recurring SS	4,021	27.2%	3,881	25.8%	4,132	25.7%	2.7%
Special SS	815	5.5%	868	5.8%	998	6.2%	22.5%
Total	14,788	100.0%	15,031	100.0%	16,050	100.0%	8.5%
<u>Real 2023 dollars</u>							
PS	11,701		11,407		10,920		-6.7%
Recurring SS	4,728		4,306		4,132		-12.6%
Special SS	958		963		998		4.2%
Total	17,386		16,676		16,050		-7.7%
<u>Production measure</u>							
Total PS/SS cost per pound							
Nominal	6.63		6.27		6.79		2.3%
Real	7.80		6.96		6.79		-13.0%

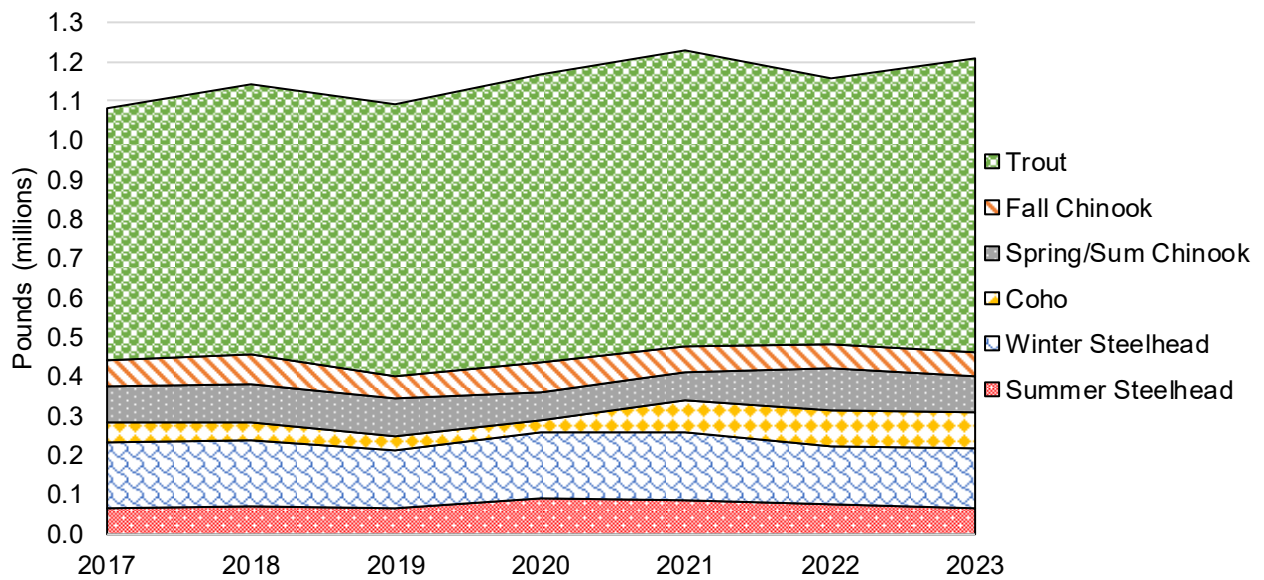
- Notes:
1. Costs are in thousands of nominal dollars or real adjusted to 2023 dollars.
 2. PS is personal services including all overhead. Recurring SS costs are supplies and services that include travel, telecom, uniform, fish feed, chemicals for fish feed, fuels, utilities, office supplies, light repairs, and miscellaneous program supplies. Special SS costs are for housing and other heavy maintenance.
 3. Costs are for bienniums and do not include all cost categories as shown on Table II.2. They are sufficiently broad for showing cost trends.
 4. Cost per pound includes all species in calendar years of the last two years of the biennium.

Figure II.1
Individual Hatchery Variable, Fixed, and Capital Contribution



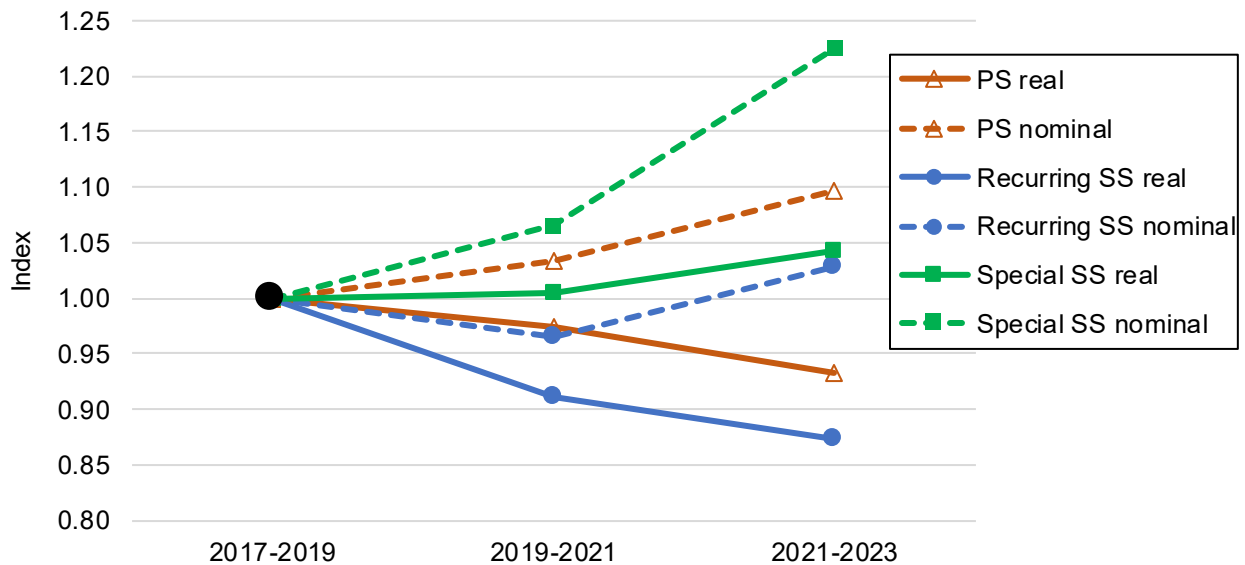
Notes: Capital contributions are annualized replacement costs. Existing facility investments are assumed to be fully depreciated.

Figure II.2
Hatchery Production Pound Trends in 2017 to 2023



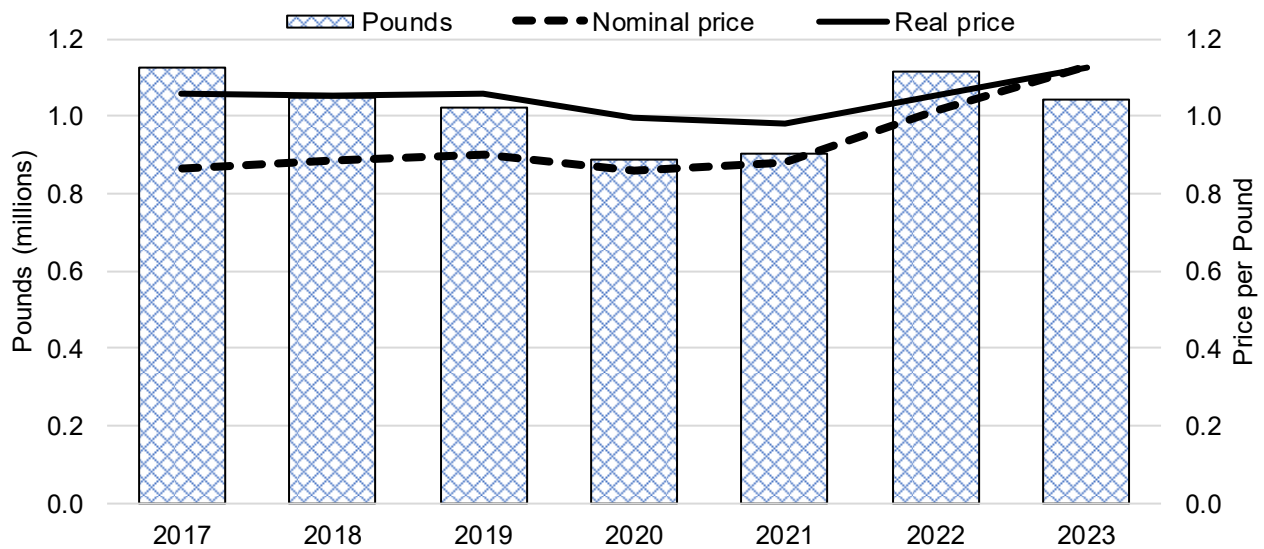
Notes: Production pounds for Clackamas Hatchery in 2023 is a two-year average for 2021 and 2022. Production pounds for Rock Creek Hatchery since 2020 is attributed pounds using the study model for 2023.

Figure II.3
Hatchery Personal Services and Supplies and Services
Cost Index Trends for 2017-2019 to 2021-2023 Biennia



- Notes: 1. Real costs adjusted to 2023 dollars.
2. PS is personal services including all overhead. Recurring SS costs are supplies and services that include travel, telecom, uniform, fish feed, chemicals for fish feed, fuels, utilities, office supplies, light repairs, and miscellaneous program supplies. Special SS costs are for housing and other heavy maintenance.

Figure II.4
Hatchery Fish Feed Price and Pounds in 2017 to 2023



- Notes: 1. Price is nominal and real 2023 dollars for fish feed purchased for State hatcheries.
2. Purchases are not differentiated for high protein mix or brands.

III. Cost Effectiveness

Cost effectiveness analysis (CEA) can be a useful economic description tool when economic active use benefits and other non-use values are difficult to measure. It simply relates costs to an analytical objective to determine the least cost way to achieve the objective. Costs can be direct costs and objectives can be whatever the purpose or purposes of the proposed action. For example, an objective can be fishery augmentation. In this case the measure is production cost divided by the fishery harvest contribution number. Another objective might be to operate hatcheries in a way that does not impair natural stocks. The measure might be cost per stray, cost per eggs produced with natural brood stock, or other measure of impacted native salmon and steelhead populations of concern. Tradeoff analysis becomes straightforward with the CEA where hatchery costs can be related to costs for other methods providing same objectives.

Oak Springs Hatchery hatch house.



Photo credit Oregon Department of Fish and Wildlife.

Example other methods might be resolving migration barriers or making habitat improvements.

The key assumption used in this CEA is that all State hatcheries have the same production objectives. This allows for comparing the hatchery costs and effects measures across hatcheries.

The provided CEA references operation costs (variable and fixed) explained in Chapter II. Facility capital costs and production pounds for individual hatcheries are

shown in Table B.3. Table III.1 shows individual State hatcheries annualized operation and capital costs per actual production pound and facility replacement cost per actual production pound. Table III.2 summarizes the cost per attributed release and actual production pound ratios by species. The cost per harvested adult by species is shown in Table III.3. Table III.4 shows individual hatchery efficiency measures by species. There are efficiency gains with larger production facilities having lower cost per pound and smaller facilities having higher cost per pound as shown on Figure III.1.

Rearing costs reflected in these indicators are highly dependent on time spent at hatcheries. Steelhead cost per release can be three times salmon releases due to the rearing time differential. The cost per harvested adult is discussed in Chapter VII with a net benefit perspective.

Although not addressed in this report, the net benefit statistic described in Chapter VII can also be a comparative efficiency indicator for other means to increase fishing opportunities (spawning habitat improvements, predation removal programs, resolving migration route impediments, etc.). Using the net benefit statistic for comparative purposes will often have time horizon complexities where the other means will take several fish generations to reach capacity production levels.

Table III.1
Individual Hatchery Operation and Annual Capital Contributions Per Facility Production Pound

Hatchery	Variable	Total Cost		Replacement Cost
		w/o Cap.	w/ Cap.	
Alesea	6.04	7.13	10.72	335
Bandon	17.63	21.73	26.20	416
Cedar Creek	9.78	11.72	16.16	414
Clackamas	14.20	17.39	21.58	391
Elk River	13.67	16.37	21.28	458
Klamath	5.29	8.88	10.61	162
Nehalem	8.28	10.17	13.69	329
Oak Springs	4.56	5.23	7.40	202
Roaring River	3.85	4.46	5.91	135
Salmon River	17.62	20.96	26.67	533
Trask	20.43	25.42	32.40	652
Wizard/Falls River	8.20	10.78	14.35	334
Rock Creek	7.08	19.04	24.58	518
Total	7.80	10.41	13.64	302

Notes: 1. Total annual cost includes variable and fixed costs. Fixed costs are itemized for with and without annual capital contribution.

Table III.2
Hatchery Cost Per Release and Per Facility Production Pound by Species

	Total	Trout	Anadromous Species					Summer Steelhead
			Subtotal	Fall Chinook	Spring/Sum Chinook	Coho	Winter Steelhead	
Releases (thousands fish)	12,514.5	4,132.0	8,382.6	1,883.1	1,958.7	2,723.8	1,417.4	399.5
Cost per release								
Variable	0.75	0.90	0.67	0.54	0.43	0.40	1.36	1.87
Total	1.31	1.59	1.17	0.82	0.86	0.70	2.35	3.25
Facility pounds (thousands)	1,198.2	725.4	472.9	63.4	90.4	87.9	159.2	71.9
Cost per facility pound								
Variable	7.80	5.11	11.93	15.93	9.39	12.52	12.13	10.41
Total	13.64	9.04	20.71	24.44	18.67	21.81	20.95	18.08

Notes: 1. Total annual cost includes variable and fixed costs. Fixed costs include annual capital contribution.

Table III.3
Hatchery Cost Per Harvested Adult by Species

	Total	Trout	Anadromous Species					
			Subtotal	Fall Chinook	Spring/Sum Chinook	Coho	Winter Steelhead	Summer Steelhead
Cost per harvested adult freshwater and ocean								
Variable cost	8.29	3.51	79	105	121	42	76	252
Total cost	14.50	6.21	137	161	241	73	132	438

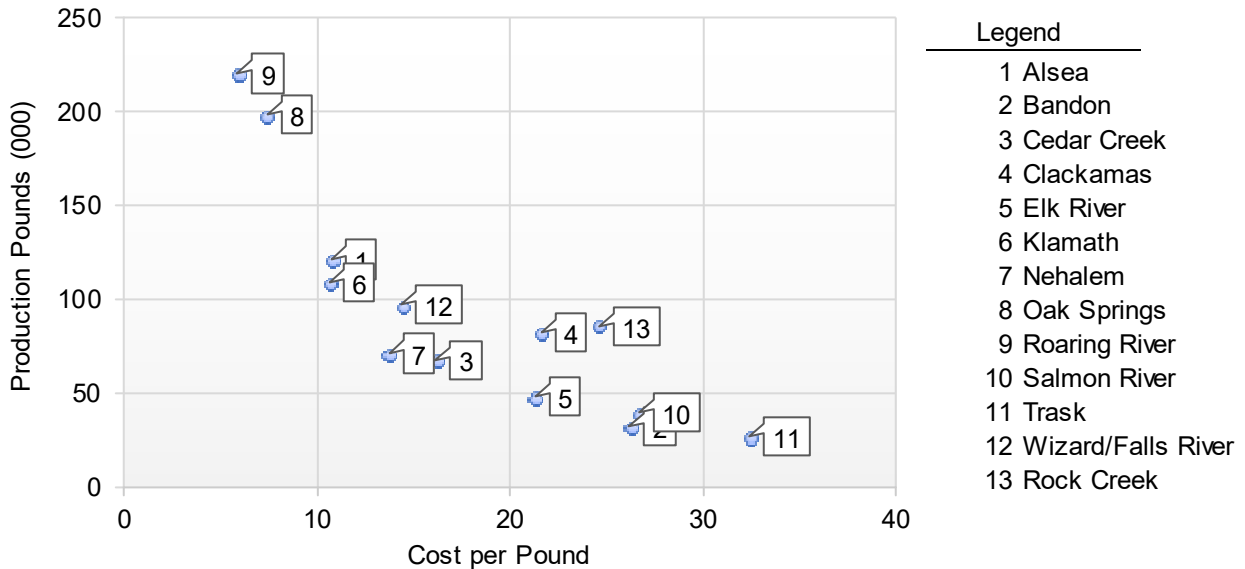
Notes: 1. Steelhead and trout fisheries are freshwater only.
2. Harvested adults are attributed catch in Oregon fisheries.

Table III.4
Individual Hatchery Efficiency Measures by Species

Hatchery	Cost per Facility Pound						Cost per Harvested Adult						
	Fall		Spr/Sum		Winter		Fall		Spr/Sum		Winter		Summer
	Trout	Chinook	Chinook	Coho	Steelhead	Steelhead	Trout	Chinook	Chinook	Coho	Steelhead	Steelhead	
Alea	6.97	--	--	--	21.35	--	7.00	--	--	--	133	--	
Bandon	19.25	44.54	--	--	21.00	--	198.29	229	--	--	146	--	
Cedar Creek	0.00	285.12	14.13	--	15.44	15.56	--	104	99	--	111	214	
Clackamas	0.00	--	31.40	14.43	84.41	173.83	--	--	525	43	182	399	
Elk River	11.20	18.00	--	--	59.98	--	15.85	311	--	--	253	--	
Klamath	10.67	--	0.00	--	--	--	10.11	--	--	--	--	--	
Nehalem	8.63	28.88	--	21.49	18.22	--	11.07	1,689	--	203	162	--	
Oak Springs	7.01	--	--	--	7.75	78.49	4.86	--	--	--	59	--	
Roaring River	5.82	--	--	--	9.69	4.67	3.23	--	--	--	127	175	
Salmon River	19.63	20.16	--	28.50	--	--	40.64	124	--	126	--	698	
Trask	0.00	27.72	34.42	206.22	28.65	--	--	61	293	221	84	--	
Wizard/Falls River	16.56	--	0.00	--	--	8.68	6.10	--	--	--	--	--	
Rock Creek	22.50	--	15.81	89.73	19.20	54.80	23.80	--	440	242	136	1,090	
All	9.04	24.44	18.67	21.81	20.95	18.08	6.21	161	241	73	132	438	

Notes: 1. Harvested adults are attributed catch in Oregon fisheries.

Figure III.1
Individual Hatchery Production Pounds and Cost Per Pound



IV. Regional Economic Impact

A. Model Methods

The public and decision makers sometimes just want to know what level of economic activity is being stirred-up within a specified geographic region stemming from a decision making action. This type of analysis providing the economic activity statistic is called Regional Economic Impact (REI). It is a way to show how direct change in expenditures is multiplied throughout the regional and statewide economies. The measurement unit for REI with most bearing is labor income, job equivalents, and state/local taxes generated. There are other equivalent measures such as business output and value added. The measures for income changes and jobs have some comparative usefulness for showing distributional effects across economies. The measures for business output and value added are less tangible when trying to relate what might happen in an economy from a public decision regarding hatcheries.

REI measurements are provided despite the limitation for only having meaning in the immediate sense. It is realized that any changes made in an economy are going to have offsetting adjustments that may be unpredictable in the long term. The REI analysis considers active use economic activity from commercial harvesting, recreational fishing, hatchery visits, and hatchery operations.

Oak Springs Hatchery intake.



Photo credit Oregon Department of Fish and Wildlife.

Key assumptions used in the REI analysis are:

- The period of analysis is indeterminate, with quantitative changes in resource costs and benefits and regional economic activity being near-term. Hatchery budget information is assembled to apply to Year 2023. It can be assumed the annual REI is for the same year. For benefits from actions to conserve depressed species, long-term effects from the recovery species would be made.

- Local level impacts are calculated for hatchery operations. Total impacts are at the state level economy. State level measurements over estimate impacts at the local level because of interactions (leakages) with state level economies.
- Recreational fisheries and visitor impacts are calculated using trip spending. Expenditures for fishing related durable items can be considerable but associating economic impacts to those expenditures is problematic. The use of purchases can be spread over many other recreational activities.
- Expenditures per day translated to REI per fish assume all trip expenditures are associated with overall trip purpose being for fishing.
- Visitor impacts are only shown for the state level economy despite spending occurs at trip origin, en-route, and destination. If known, the location spending could be included in impact calculations at the local level.
- No differentiation is made between anglers that are residents and nonresidents. This is important to point out because non-resident spending in regional economies generates new income through their trip expenditures. Local resident fishing trip spending may or may not have been spent anyway in the regional economy.
- Commercial fishing economic benefits include effects from harvesting and primary processing.
- Hatchery operations light and heavy maintenance is included as a fully expensed annual expenditure, but effects from any major one-time improvement construction is not included.
- No substitution is assumed. If fishing opportunities provided by State hatcheries are reduced, are there alternative fishing opportunities available? Will there be same spending for non-fishing activities? Will changes to hatchery objectives have alternative REI effects?
- The ocean and freshwater fall salmon fisheries are mixed stocks (coho and fall Chinook) and the proportion of species catch during a trip is not always reported. An assumed fishery's target species is used to determine total trip days and economic benefits. It was assumed coho was the target species in the ocean fishery and Chinook was the target species in the freshwater fishery. The proportion of species economic benefits is based on catch.

- Economic model inputs assume existing environmental, fisheries, markets, and hatchery production conditions:
 - Protected habitat conditions (inland and estuarine) as they influence wild fish survival/recovery.
 - Stable ocean and freshwater conditions as they influence SAR for anadromous and trout species. This assumption includes unchanged predation and other fish passage mortality rates.
 - Continued management regimes in ocean mixed stock fisheries based on assumptions about hooking and handling mortality rates, wild fish encounter rates, bycatch levels and commercial/sport catch allocation schedules.
 - Attainable harvest rates on hatchery fish in inland fisheries for anadromous and trout species.
 - Continuation of current commercial fish prices.
 - Same processing product forms, yields, labor requirements, investment returns, locations, and market prices.
 - Unaltered hatchery production objectives with same costs (variable, fixed and capital contributions) and release locations.
 - Unchanged headquarter services and costs.
 - Same repair and heavy maintenance levels and access to capital improvement programs such as R&E.

The REI calculation equations using algebraic notation are as follows. The input data numbered sources showing in brackets refer to Table I.1.

Equation IV.1

$$RPFT = RPDT \cdot (1 / CPUET)$$

where: *RPFT* = regional economic impacts per fish for trout

RPDT = regional economic impacts per day for trout [22]

CPUET = catch per unit effort for trout fisheries [5]

Equation IV.2

$$RPFR_f = RPDR \cdot SCR_f \cdot PR_f$$

where: *RPFR* = regional economic impacts per fish for recreational anadromous fisheries

RPDR = regional economic impacts per day for target species recreational anadromous fisheries [17]

SCR = success rate for anadromous fisheries [6], [7], [8]

PR = proportion of catch

f = recreational anadromous fisheries

Equation IV.3

$$RPFC_l = RPP_l \cdot PPF_l$$

where: *RPFC* = regional economic impacts per fish for commercial fisheries

RPP = regional economic impacts per pound by commercial fisheries [18]

PPF = pounds per fish caught in ocean and Columbia River by fisheries [10], [11]

l = commercial fisheries

Equation IV.4

$$ATT_{m,k} = REL_{m,k} \cdot SAR_{m,k} \cdot MO_{m,k}$$

where: *ATT* = attributed adult harvests by fishery and hatchery
REL = releases by fishery and hatchery [3]
SAR = smolt-to-adult rate for Oregon fisheries [9]
MO = hatchery share rearing months of total months at release [12]
m = recreational or commercial or trout fisheries
k = hatcheries

Equation IV.5

$$REI_{m,k} = RPF_{m,k} \cdot ATT_{m,k}$$

where: *REI* = regional economic impact for fisheries at hatchery *k*
RPF = regional economic impact per fish for Oregon recreational and commercial fisheries

Equation IV.6

$$REIV_k = MPF \cdot CNT_k \cdot RPV$$

where: *REIV* = regional economic impact from hatchery visitor trip spending
MPF = assumed multipurpose trip factor
CNT = hatchery visitor counts
RPV = regional economic impacts per trip [23]

Equation IV.7

$$DVC_{m,k} = PPF_{m,k} \cdot ATT_{m,k} \cdot PRC_m$$

where: *DVC* = direct value for commercial fisheries
PRC = harvest price for fisheries [19]

Equation IV.8

$$DVR_f = RTR_f \cdot REI_m$$

where: *DVR* = direct value for recreational fisheries trip spending
RTR = ratio of expenditures to regional economic impacts from fisheries trips [36], [37]

Equation IV.9

$$DVV_k = RTV \cdot REIV_k$$

where: *DVV* = direct value from visitor trip spending
RTV = ratio of expenditures for regional economic impacts from visitor trip spending [40]

The study's REI model translates benefiter and hatchery operation spending into measurements of economic effects within study adopted economies. Using existing secondary industry input-output relationship models, the initial spending is tracked for respending until the money leaks out from the study economies. The model inputs for initial spending are characterized by benefiter direct values (DV) and the previously described hatchery costs.

B. Direct Values

The State hatchery summed DV are \$0.4 million commercial harvest value, \$62.3 million recreation spending and \$6.5 million visitor spending (Table IV.1). These DV represent commercial fisheries 166 thousand pounds anadromous species catch, 659 thousand recreational fishing angler days and 169 thousand visitor days. There are other production

related direct and indirect financial values not included such as egg/carcass sales, surplus fish sales, food bank donations, and supplying fish to tribes for ceremonial and subsistence purposes.

The DV calculations for commercial fisheries revenue and recreational fisheries first round spending may give some information about revenue flows, but do not reflect total impacts on an economy nor do they reflect a dollar value that can be used to compare and contrast fish resource benefits. Harvest value does reflect market forces that define the revenue a harvester receives from an initial buyer. However, the revenue alone is not a predictor of NEV without knowing harvester and processor profitability (TRG 2009b). While recreational expenditures provide prima facie backing there is value, they are not a measure of that value (Huppert 1983). They do not account for the regard an angler holds for the quality of the fishery. Expenditures are a cost whose change may conflict with a fishery value shift. When costs go down, the angler may decide whether the fishery value increases.

Economic and social values are better reflected in REI and NEV measurements. But even with their better meaning, they are only the value of fishing and not the value of fish resources. That value is much more complex and is addressed in Chapter VI where passive use and cultural values are discussed.

C. Results Discussion

Results for total fisheries related REI labor income is shown in Table IV.2. The total REI from fisheries is \$39.3 million labor income of which \$25.6 million is from trout fisheries and \$13.7 million is anadromous fisheries. Anadromous commercial fisheries REI is a small contributor to Oregon total salmon fisheries REI (TRG June 2024). Oregon commercial salmon troll and net fisheries REI in 2021 is \$13.0 million labor income (2023 dollars). Study results show modeled REI from Oregon State hatcheries contributions from anadromous fisheries in 2023 are \$0.7 million labor income or a six percent share. The two base years are incongruous, but the comparison gives a picture of the relative share that State hatchery production contributes to the State's commercial salmon fishing industry.

Fisheries REI per harvested adult by Oregon harvesting location and species is shown on Table A.5. For example, one adult harvested spring Chinook averaged across all fisheries generates \$466 labor income and one harvested trout generates \$24 labor income.

Selective spending categories for hatchery costs are used in hatchery operation REI calculations. For example, the local economy REI does not include headquarter costs. The local and statewide REI does not include capital contribution cost estimates. Capital costs would be properly included when construction spending actually occurs. Table B.2b shows the calculations for individual hatcheries operations REI at the local and statewide economy level. The summed hatchery operations REI at the local economy level is \$8.2 million labor income and \$11.3 million labor income at the state economy level. Table IV.3 shows individual hatchery REI from visitors, attributed fisheries and hatchery operations.

Total REI attributed benefits from fisheries, visitor spending and hatchery operations for State hatcheries is \$55.5 million labor income which is equivalent to 1,100 jobs in the state level economy (Table ES.3).^{1,2} State/local tax associated with this economic activity is \$6.0 million. Federal taxes would be in addition to this amount. Trout fisheries contribute about 46 percent of the REI, followed by anadromous species fisheries (25 percent), hatchery operations (20 percent) and hatchery visitors (nine percent) (Figure ES.1).

Table IV.1
Hatchery Fisheries by Species and Visitor Direct Values

	Total	Trout	Anadromous Species					Summer Steelhead
			Subtotal	Fall Chinook	Spring/Sum Chinook	Coho	Winter Steelhead	
Fisheries (thousands)								
Commercial harvest value								
Columbia River	209.8	--	209.8	--	9.1	200.7	--	--
Ocean	174.2	--	174.2	78.3	94.3	1.6	--	--
Recreational trip expenditures								
Coast	30,345.6	9,482.5	20,863.1	3,892.6	4,796.4	1,171.6	10,000.0	1,002.5
Columbia River	31,479.3	25,961.0	5,518.2	--	1,451.9	1,074.9	2,505.2	486.3
Ocean	461.0	--	461.0	79.5	93.0	288.5	--	--
Visitor trip expenditures (thousands)								
	6,538.3							
Commercial pounds								
Columbia River	148,049	--	148,049	--	1,125	146,924	--	--
Ocean	18,208	--	18,208	8,084	9,730	394	--	--
Recreational angler days								
Coast	293,363	120,451	172,912	32,262	39,753	9,710	82,880	8,308
Columbia River	361,875	329,767	32,108	--	8,448	6,254	14,577	2,829
Ocean	3,549	--	3,549	612	716	2,221	--	--
Visitor days	168,550							

¹ Local and State economy level REI impacts (labor income and equivalent jobs) for hatchery operations by individual hatcheries are shown on Table B.2b.

² Attributed fisheries REI is about two-thirds of the fisheries REI when all release benefits are credited to a rearing (partial or entire) hatchery.

Table IV.2
Hatchery Fisheries Regional Economic Impact by Species

	Anadromous Species							
	Total	Trout	Subtotal	Fall Chinook	Spring/Sum Chinook	Coho	Winter Steelhead	Summer Steelhead
REI total (thousands)	39,303.2	25,576.0	13,727.2	2,071.6	3,266.3	1,593.7	6,072.6	722.9
Freshwater	38,761.8	25,576.0	13,185.8	1,890.3	3,049.3	1,450.8	6,072.6	722.9
Coast hatcheries	16,973.8	6,842.6	10,131.2	1,890.3	2,329.2	568.9	4,856.0	486.8
Col. R. hatcheries	21,788.1	18,733.5	3,054.6	--	720.1	881.8	1,216.5	236.1
Commercial	374.9	--	374.9	--	15.1	359.8	--	--
Recreational	21,413.1	18,733.5	2,679.7	--	705.0	522.0	1,216.5	236.1
Ocean	541.4	--	541.4	181.4	217.0	143.0	--	--
Commercial	317.5	--	317.5	142.8	171.9	2.9	--	--
Recreational	223.9	--	223.9	38.6	45.1	140.1	--	--

- Notes: 1. REI expressed in thousands labor income in Year 2023 dollars.
 2. Columbia River categorized hatcheries include Clackamas, Oak Springs, Roaring River, and Wizard/Falls River.

Table IV.3
Individual Hatchery Visitor Counts and Visitor/Fisheries/Operations Regional Economic Impacts

Hatchery	Visitor	Visitor REI	Attributed Fisheries REI	Operations REI		Statewide
	Counts	Statewide		Local	Statewide	Total REI
Alesea	5,000	146	3,341	652	897	4,384
Bandon	3,000	87	1,016	553	748	1,851
Cedar Creek	4,000	116	2,835	640	861	3,812
Clackamas	20,000	582	2,142	847	1,160	3,884
Elk River	2,500	73	794	583	791	1,659
Klamath	8,000	233	2,765	539	744	3,742
Nehalem	5,500	160	1,483	566	773	2,416
Oak Springs	750	22	6,881	788	1,082	7,985
Roaring River	18,000	524	8,352	693	965	9,842
Salmon River	2,800	82	785	624	846	1,713
Trask	12,000	349	1,989	532	728	3,066
Wizard/Falls River	80,000	2,330	4,918	767	1,085	8,332
Rock Creek	<u>7,000</u>	<u>204</u>	<u>2,002</u>	<u>414</u>	<u>594</u>	<u>2,800</u>
Total	168,550	4,909	39,303	8,197	11,273	55,484

- Notes:
1. REI expressed in thousands labor income in Year 2023 dollars.
 2. REI local effects from hatchery operations and support spending. See Table B.2 for REI local effects measured by jobs.
 3. REI statewide hatchery operations effects include local effects at the statewide economy level plus feed, headquarter, administration, field management, and heavy maintenance spending. Bond expenses, wildfire payments, and annual capital cost contributions are not included in the REI calculations.
 4. Klamath Hatchery is temporarily closed to visitors due to access road damage so estimates are based on visitor counts prior to closure. Rock Creek Hatchery visitor count is based on activity prior to wildfire damage closure.

V. Net Benefits

This chapter provides information about hatchery program net benefits. The net benefits are a calculation for net economic value (NEV) held by users of hatchery production minus hatchery production costs. The calculation can result in a negative number unlike the calculation of regional economic impacts (REI) shown in the previous chapter which is always positive. REI calculations utilize the user spending and the hatchery production costs to show how much money is stirred up in an economy as expressed in a variety of measurements. The net benefits are expressed as an absolute measure (i.e. the difference) and as a ratio of NEV divided by costs. A ratio greater than or equal to one is synonymous to a calculation result that net benefits are positive. The net benefit results are not so much about the veracity of the number, but providing information about social welfare and production efficiencies.¹ In addition to providing net benefit numbers, this chapter contains interpretive discussions about benefiter social impacts.

The net benefit calculation is more widely referred to as benefit-cost analysis (BCA). It is an economic analysis tool with different complexity levels in its application. A tool advantage is being able to incorporate a time dimension to the NEV and costs. For example, major improvements may be necessary in the future to keep a hatchery in operation. Or there might be planned operation production changes in the future that will influence NEV. There are techniques to account for the future benefits and costs to relate result information to valuations today. A result when there are time dimensions is net present value (NPV). The NPV metric reduces discounted monetary values from timing of future costs to an equivalent value in a current year. There are additional complexities with accounting for indirect effects such as benefiter opportunity costs (for example lost wages from time spent recreational fishing) and lost production in wild stocks.² Study resources allowed for a limited BCA application where direct NEV and current year costs are utilized in the calculation. While it is a limited approach, it still provides rich understandings about the provision of a public service.

The public pays for manufacturing a product and it is given away as an opportunity for recreational anglers to enjoy a fishing experience, commercial fishing interests to generate a profit, tribes to use fish for ceremonial and subsistence (C&S) purposes, etc. A measurement for this type of effect is to find the change in social welfare or the value to consumers and producers of this manufactured product.

¹ CEA discussed in Chapter III, which uses harvest numbers and the cost side of production, can similarly be useful for showing operation efficiencies.

² Potential benefits foregone by the choice to use a resource in one way rather than another is referred to as opportunity costs. Sometimes it is difficult to determine on which side of the equation an opportunity cost is placed, let alone determining its size. For example, a fish not harvested has minus benefits from a fishing activity and may have positive benefits from its non-use. However, in the case of hatchery production for sustaining fisheries, that fish may return to the hatchery and not be needed for even broodstock to maintain future populations. Those fish might be donated to food banks, which have value determined by the cost it would take to substitute food. Generally, opportunity costs are on a tier not included in quantitative analysis because they are indefinable and they will cancel their influence on an equation's results.

Trask Hatchery hatch house.



Photo credit Oregon Department of Fish and Wildlife.

The value to consumers (for example a recreational angler) can be measured in terms of their willingness-to-pay (WTP), whereas value to producers (for example a commercial fisheries harvester) can be approximated by the change in net income or profits. For recreational fishing benefits, consumer surplus is the difference in WTP for a heightened experience minus the cost for the existing level of enjoyment. The dollar value information is usually gathered in an angler survey. Questions are asked about additional costs that would be acceptable to catch additional fish. For commercial and recreational fishing, the producer surpluses are the profits realized by businesses. This

would include commercial fishing harvesters and processors, recreational angling guide services, lodging businesses, etc.¹

Other values that could be included in a BCA are associated with non-consumptive uses and non-uses of the resource. An example of a non-consumptive use of the resource is viewing migrating salmon at fish ladder interpretative centers. An example of a non-use is the value people derive from certain resources without ever directly or indirectly using them. These existence values are additive over and above the use values. Only the active use values from recreational and commercial harvesting activities are included in this study's model. The passive use values (i.e. resource non-use) are discussed qualitatively in Chapter VI.

The BCA for this study is referenced as a limited analysis. Not all benefits (such as passive use values) or costs (such as adverse impacts to wild stocks) are considered. Important components of the equation do not have readily available input values nor are they necessarily warranted for inclusion. First, for those effects that can be quantified, the level of uncertainty associated with the estimates is believed to be relatively large. Second, there is incomplete scientific basis for being able to predict biological and economic effects in a short or long term. Because the analysis adopts a single-time approach of potential effects that are near term in nature, study modeling does not take into account adjustments that would be made over time. Despite the limitations, offered BCA should be considered a comparative tool that can provide insight into

¹ For commercial fishing benefits, there is also consumer surplus (difference in WTP for seafood minus what is actually being paid). Economic theory says that prices will rise if the resource supply is constrained, and therefore consumer surplus would decrease as long as WTP stays the same. It is suggested that there are many salmon substitutes, and depending on how discriminating the consumer might be towards the resource, the number of harvested fish being changed will probably not change the price.

the relative magnitude and direction of economic changes associated with hatchery production practices.

Key assumptions used in the BCA are as follows.¹

- Producer (commercial harvester and processor, and charter boat operator) opportunity costs are undefinable;
- Producer surplus recreational uses, such as from charter boats, guide services, marinas, lodges, and other recreational related businesses, is comparatively small;
- Consumer WTP and existing seafood prices would be unaffected;
- Hatchery labor is comprised of skilled occupations and those occupations are in a ready demand status, therefore, hatchery labor benefits equal labor costs;
- The effects from other user groups and changes to harvest management regimes such as ocean fisheries bycatch, C&S harvests, research, etc. are not applicable;
- Non-consumptive use and non-use values are inconsequential to the quantitative analysis; and,
- Interactions with other fisheries are not economically significant.

The BCA analysis does not attempt to measure State hatcheries program total benefits over time in relation to its costs. It only provides simple one-time estimates of benefits from commercial and recreational harvests and visitors.

The equations to calculate NEV are interchangeable with REI equations described in Chapter IV and are not repeated. NEV borrowed data sources are shown in Table I.1. For recreational fisheries NEV, the studies generating values generally are for surveys that determine WTP for a fishing experience per day.² It was necessary to convert fish to days which can suspect value meaning. A fishery with a low catch rate would inconsistently have an average value per fish greater than a fishery with a high catch rate. It could be there are high quality fisheries having a high WTP with low catch. An example (not substantiated with a literature reference) might be the trout fisheries for legal (high catch rate) versus trophy size (low catch rate).

A modeling issue when converting fish to days is that the ocean and freshwater fall salmon fishery is mixed stock coho and fall Chinook, yet survey results identify CPUE singularly for the combined species trip. To determine the conversion, it was necessary to assume a target species for a trip. The target species was coho for the ocean fishery and Chinook for freshwater fishery. The proportion of species NEV is based on the fishery's coho and Chinook catch.

¹ The assumptions list was prepared by the TRG for the economic analysis of Mitchell Act (MA) hatcheries. TRG used the same BCA methods for that project. The economic analysis report is Appendix I in NMFS (2010).

² A recent study of Oregon and Washington ocean recreation fishery was to determine WTP results per salmon catch (Anderson and Lee 2013). Modeled results show WTP for hatchery and wild salmon separately across species, size, and whether or not the fish may be legally retained. For example, WTP values for hatchery Chinook that can be kept are higher than the corresponding values for wild origin. Some anglers indicated that they release wild salmon they could legally keep due to a conservation motive. The differences results were not universally applicable to all the fisheries analyzed in this hatchery economic analysis study.

Fisheries NEV by species is shown in Table V.1. NEV per harvested adult is shown in Table A.6. Fisheries with high NEV per harvested adult include the angler prized Columbia River spring/summer Chinook. The fishery has high demand and low CPUE (Table A.1). The adopted spring/summer Chinook fishery CPUE (11.45 angler days per fish) is from [6]. The adopted coastal coho fishery CPUE (15.00 angler days per fish) is averaged over hatchery and wild origin stocks and has high (41 percent) non-retained catch rate [7].

Net benefits by species is shown in Table V.2. The fisheries benefit cost ratio is positive for all species except summer steelhead at 0.83. Trout fisheries have the highest ratio at 6.33.

Individual hatchery net benefits from fisheries and visitors are shown on Table V.3. All-hatcheries ratios are positive and range from lowest Elk River (1.21) closely followed by Salmon River (1.22) to highest Roaring River (10.61). In general, the hatcheries with the higher proportion of trout production had higher benefit-cost ratios. Also, there is a strong relationship between net benefits and cost per pound at these facilities, with larger facilities having lower cost per pound and smaller facilities having higher cost per pound.

The key variable in calculating net benefits for fisheries is SAR. Figure V.1 shows fisheries net benefit sensitivity to SAR uncertainty. The percent change in SAR for net benefits to be zero are annotated on each species figure. The only species requiring positive movement is summer steelhead. That species SAR would have to be 20.0 percent greater for net benefits to be zero. A more comprehensive approach to net benefit sensitivities would include showing simultaneous NEV variability.

Table V.1
Hatchery Fisheries Net Economic Value by Species

	Total	Trout	Anadromous Species					
			Subtotal	Fall Chinook	Spring/Sum Chinook	Coho	Winter Steelhead	Summer Steelhead
NEV fisheries (thousands)	62,129.4	41,531.5	20,597.9	3,204.6	4,767.6	2,062.2	9,480.0	1,083.4
Freshwater	61,768.8	41,531.5	20,237.3	3,138.2	4,689.7	1,846.0	9,480.0	1,083.4
Coast hatcheries	27,931.2	11,111.3	16,819.9	3,138.2	3,866.9	944.5	8,062.0	808.2
Col. R. hatcheries	33,837.6	30,420.2	3,417.4	--	822.8	901.5	1,417.9	275.2
Commercial	35.9	--	35.9	--	1.0	34.9	--	--
Recreational	33,801.7	30,420.2	3,381.5	--	821.8	866.6	1,417.9	275.2
Ocean	360.6	--	360.6	66.4	77.9	216.2	--	--
Commercial	15.4	--	15.4	6.9	8.3	0.2	--	--
Recreational	345.2	--	345.2	59.5	69.6	216.0	--	--

- Notes: 1. NEV expressed in thousands of Year 2023 dollars.
2. Columbia River categorized hatcheries include Clackamas, Oak Springs, Roaring River, and Wizard/Falls River.

Table V.2
Hatchery Net Benefits from Fisheries by Species and Visitors

Species	Cost Base		Attributed Benefits NEV			Net Benefits		Benefit-cost Ratio
	Variable	Total	Commercial	Recreational	Total	Variable	Total	
Trout	3,707	6,559	-	41,531	41,531	37,824	34,973	6.33
Fall Chinook	1,009	1,549	60	3,145	3,205	2,195	1,656	2.07
Spring/sum Chinook	849	1,688	71	4,697	4,768	3,918	3,080	2.82
Coho	1,101	1,918	251	1,811	2,062	961	144	1.08
Winter steelhead	1,932	3,336	-	9,480	9,480	7,548	6,144	2.84
Summer steelhead	749	1,300	-	1,083	1,083	335	(217)	0.83
Visitors					4,214	4,214	4,214	
Total	9,347	16,350	381	61,748	66,344	56,996	49,994	4.06

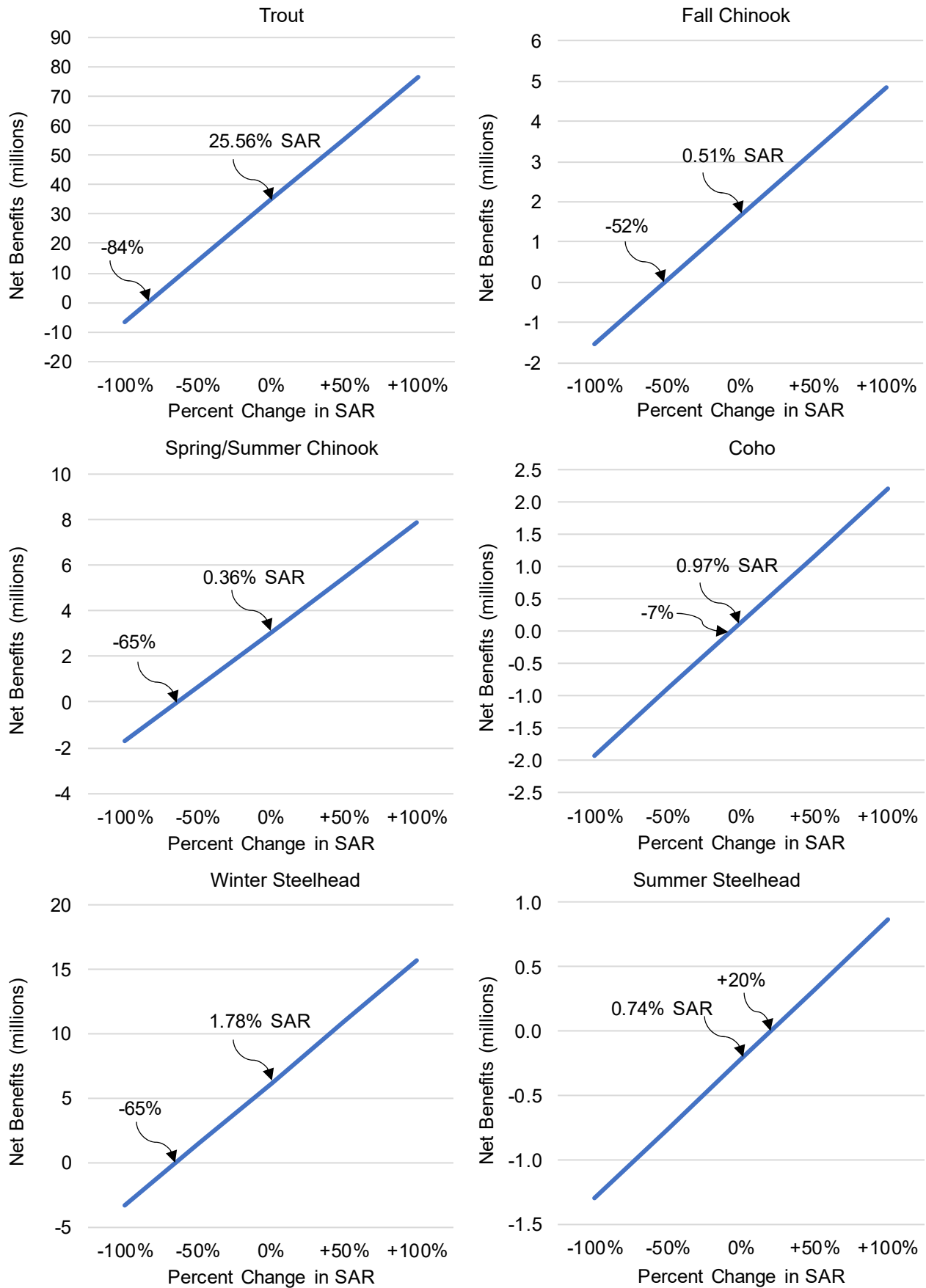
- Notes: 1. Cost and NEV expressed in thousands of Year 2023 dollars.
2. Total net benefits are summed fisheries NEV and visitors NEV minus hatchery costs expressed in thousands of Year 2023 dollars.
3. Cost base total includes variable and fixed costs. Fixed costs include annual capital cost contributions.

Table V.3
Individual Hatchery Net Benefits from Fisheries and Visitors

Hatchery	Cost Base		Attributed			Net Benefits		Benefit-cost Ratio
	Variable	Total	Fisheries Benefit NEV	Visitor NEV	Total NEV	Variable	Total	
Alesea	731	1,297	5,469	125	5,594	4,864	4,297	4.31
Bandon	565	840	1,630	75	1,705	1,140	866	2.03
Cedar Creek	662	1,094	4,603	100	4,703	4,042	3,609	4.30
Clackamas	1,168	1,776	2,371	500	2,871	1,703	1,095	1.62
Elk River	657	1,023	1,178	63	1,241	583	218	1.21
Klamath	576	1,154	4,489	200	4,689	4,114	3,535	4.06
Nehalem	587	971	2,430	138	2,568	1,981	1,597	2.64
Oak Springs	904	1,465	10,951	19	10,969	10,066	9,504	7.49
Roaring River	848	1,301	13,358	450	13,808	12,961	12,507	10.61
Salmon River	697	1,055	1,219	70	1,289	592	234	1.22
Trask	551	874	3,265	300	3,565	3,014	2,691	4.08
Wizard/Falls River	796	1,393	7,986	2,000	9,986	9,190	8,593	7.17
Rock Creek	<u>607</u>	<u>2,107</u>	<u>3,180</u>	<u>175</u>	<u>3,355</u>	<u>2,748</u>	<u>1,248</u>	1.59
Total	9,347	16,350	62,129	4,214	66,344	56,996	49,994	4.06

- Notes: 1. Cost, NEV, and net benefits expressed in thousands of Year 2023 dollars.

Figure V.1
Hatchery Net Benefits from Fisheries Sensitivity to SAR Uncertainty



Notes: 1. Annotated SAR is an effective rate used in model for calculating attributed net benefits. Annotated percent change in SAR shows variation necessary for net benefits to be zero.

VI. Passive Use and Cultural Value

A. Passive Use Value

This section will provide a discussion of passive use values.¹ Passive uses pertain to the existence of the fish resource including derivatives for providing an option to use the resource (option value), maintaining the resource for future generations (bequest value), and believing fish should be abundant so that others can benefit (altruistic value). Measuring these values is more complex and their abstract nature makes them difficult to understand, thus it is more troublesome to incorporate them into policy making decisions (Arror 1993).

Economists have defined and occasionally measured values associated with the simple presence of a fish population.² The value is reckoned as the amount that people would be willing to pay to assure the existence of a fish stock, or to pay for a specified increase in the fish stock. Unless explicitly specified in the survey questions, study results will not separately account for differences between hatchery and wild origin fish. This is confounded by some hatchery objectives are to restore fish stocks and science findings that hatchery production can adversely impact wild stocks. Policy maker reference to passive use values need to be aware of the dichotomy that may exist in the fish origin valuations.

A survey premise or separate question should also specify the extent of ecological value a responder considers. Anadromous fish play a role in ecosystem predator and prey relationships and ocean/freshwater nutrient transport (Holtgrieve and Schindler 2011). Cederholm et al. (2000) states, "As a seasonal resource, salmon directly affect the ecology of many aquatic and terrestrial consumers, and indirectly affect the entire food web." Without the premise or question, it would be unclear if the determined passive use value includes anadromous fish role in supporting overall ecosystem health or just the consumptive use of fish.

The Bell et al. (2003) study has particular applicability in locality and pertains to enhancing fish runs. The study used a contingent value method to survey three Oregon Coast communities regarding their willingness to pay for local coho salmon enhancement programs. Findings indicate that households were willing to pay \$40 to \$193 per year (2023 dollars) to prevent the species from going extinct to \$35 to \$202 per year (2023 dollars) to have high catch rates

¹ See TRG (2006) for a more full discussion for considering passive use value for hatchery management policy making.

² Economic values can be nonmarket (no market information exists), as well as financial (prices exist from markets where traded goods are for well-defined property rights that are exclusive, transferable, and enforceable [Panayotou 1992]). For example, some people (termed non-users) who do not actually fish may still place a value on the existence of the resource. Deriving this value must rely on expressed preference information (either real or hypothetical) gathered through surveys that address the particular setting and policy issues needing decisions. Such values can play a significant role in determining future programs related to the management of a natural resource and should be a criterion in any policymaking. However, they should be used carefully in the decision making because of the difficulties in measuring such values.

depending on the household income (low or high) and the location (Tillamook Bay, Yaquina Bay or Coos Bay).

Layton et al. (1999) created an individual value function for a variety of fish categories (including Columbia basin migratory fish) among Washington residents. Completed for the Washington Department of Ecology, that study developed a means of estimating WTP for any given increase in fish population from an assumed current level, and for two different "without program" fish population projections. For example, for a current fish population of two million and a projected stable future population of two million in the Columbia Basin, Layton et al. (1999) finds that the typical Washington household would be WTP \$203 per year (2023 dollars) for a 50 percent increase in the migratory fish population. This value does not distinguish the difference in values between households who fish versus do not fish. With a total of two million households holding such values, the overall average value per fish is \$458 (2023 dollars). This particular study's estimate pertains to a rather broad class of fish, including all hatchery and wild origin stocks in the Columbia Basin.

Loomis (1999) developed a marginal (e.g. the value of the next additional fish) WTP benefit function based on increases to salmon populations on the lower Snake River. The study argues the benefit function is representative of the entire Pacific Northwest salmon population. The value that society places on the marginal fish returning to spawn in any one Northwest river is a function of the aggregate count of all salmon returning to spawn in all Northwest rivers. Also, the results indicate that the marginal value goes down as the total population of salmon goes up. EcoNorthwest (January 2009) used the Loomis (1999) study to estimate the passive use value for Pacific Northwest salmon to be annual marginal \$1,427 and the average \$2,583 (2023 dollars) when assessing Rogue River salmon.

Other passive use value research concerning saving or increasing salmon abundance include Olsen et al. (1990). The study offered different values for salmon and steelhead in different locations (Washington, Oregon, Columbia River Basin). Households were itemized for those that fish and those that do not fish. Households that do not fish had an average WTP of \$58 per year to double salmon populations while households that do fish had an average WTP of \$158 (real 2023 dollars) to double salmon populations.

The passive use values, no matter how remarkable high and tenuous in their derivation, are important for bringing into perspective active use values. Any passive use value measurement associated with policy decisions affecting fish resources will usually dwarf active use values. A relatively small proportion of West Coast residents participate in fishing while surveys show many households hold value for fish resource existence even though they likely will never participate in salmon fishing or even view a wild salmon (Loomis 1999). It is incumbent on the presenter of the measurement to explain the measurement's applicability, including it not being additive with other measures.

From previous chapter discussions about fish resource active use values and this chapter definition of passive use values, there is a decision necessary on which value to focus on for the

fish resource question being addressed. For example, if a particular fish resource is not depleted or threatened with extinction and the action being considered will not adversely impact the fish resource, there is less need to consider the existence value of that resource. Since society would not be deciding whether to allocate scarce resources to restore or save fish, the existence value is less relevant. If the policy decision under consideration is whether to invest resources to increase the fish populations, then the values which are measured will correspond to only the increase in fish numbers. In other words, passive use value would be a less appropriate value to compare with the value of the resources necessary to increase the population by some incremental amount. Given the interconnectedness of fish resource impacts that may occur from decisions about hatchery management, as well as the fact that the existence of some fish populations may be in question, measurements of both active and passive use values can be important to decision makers.¹

B. Cultural Value

Fish resources can be related to a society's importance beyond its economic value (Ignatius et al. 2019). This is a cultural perspective that recognizes the shared ways in which fish and the fisheries are important to human communities, and does not view values as something inherent to the environment or to individuals. This perspective is not always incorporated into fish resource decision making. Of special consideration is the cultural value tribal communities have for fish resources.

Many tribes live and fish in Oregon. Anadromous fish species and resident fish are interconnected with tribal culture and have been since time immemorial (Sutton 2017). There are nine federally recognized tribes in Oregon and additional tribes that had traditional and customary boundaries in parts of the state of Oregon or had ceded or reserved lands within the state of Oregon; many of which utilize fish occasionally including special occasions (ceremonies, celebrations, funerals, etc.) and for cultural identity (Wilkinson 2000, Quaempts et al. 2018, Earth Economics 2021). Several tribes in the analysis area are party to treaties with the US that reserve tribes fishing rights. These tribal treaty-reserved rights have been held by the courts to include the right to half of the harvestable salmon returning to these waters every year. The U.S. has Indian trust responsibility for all tribes whether or not there are treaties. Trust responsibilities are fiduciary obligations to protect tribal lands, assets, and resources. Several tribes have recently signed memorandums of agreement with ODFW to advance the government-to-government relationships between those tribes and the State of Oregon and enhance tribal sovereignty.²

¹ Naish et al. (2008) discussed hatchery production in context with the political response to societal demands for salmon and steelhead harvest and conservation. They found that economic analysis rarely plays a role in decision making for that response. They conclude that knowledge gaps may have prevented that information from being generated in the past, but suggest that future political responses need not be made in ignorance of significant economic implications.

² The ODFW website provides information about tribal relationships and interrelated natural resource policies https://www.dfw.state.or.us/tribal_relations/

State hatchery anadromous fish releases are for returning stocks not generally harvested in Columbia River zones where commercial treaty fisheries occur. However, increases and decreases in hatchery production could have direct or at least indirect impacts to all tribes from necessary fisheries management addressing allocation of changed abundance.

Three examples are offered for State hatchery programs with direct tribal involvement.

- The Yakama Nation, Confederated Tribes of Warm Springs, Confederated Tribes of the Umatilla, and the Nez Perce Tribe hold treaty-reserved access to harvest along the Willamette River. The Willamette Falls area is the ancestral homelands of the Confederated Tribes of Grand Ronde. The treaty fishery tribes in some years will harvest salmon at Willamette Falls to fulfill C&S fisheries needs. Adult returns from Roaring River and Clackamas Hatchery spring Chinook and steelhead releases contribute to the Willamette River fishery.¹
- The Confederated Tribe of Siletz Indians operates the Lhuuke Illahee Fish Hatchery near Logsdon, Oregon. Tribe members volunteer for the maintenance, feeding, rearing, and adult recovery at the hatchery. This offers an opportunity for education and work experience. Tribal members become involved in indigenous cultural practices. Winter steelhead adult returns contribute to the Siletz River recreational fishery. The program provides up to 5,000 smolts from Siletz River wild winter steelhead broodstock spawned and reared at the Alsea Hatchery.
- The Coquille Indian Tribe members participate in Coos River fall Chinook broodstock capture. The Bandon Hatchery rears up to 100,000 fall Chinook fish to pre-smolt size for transfer to Coquille Tribe facilities for acclimation and release into Fourth Creek. The Bandon Hatchery also raises smolts to a larger size for release in other locations in the Coos River basin. ODFW provided approximately 70 adult (1,050 pounds) spring Chinook to the Tribe from Cole Rivers Hatchery for tribal subsistence and ceremonial use. Approximately 500 additional pounds of fall Chinook was provided from Bandon Hatchery for tribal subsistence and ceremonial uses.

Distribution of fish from hatchery programs with tribal involvement is directly affected by levels of hatchery production. Changes to hatchery production as well as changes in environmental conditions could reduce the number of salmon and steelhead available for tribal use.

C. Environmental Justice

This study is an economic analysis about status quo conditions, but if there was change in hatchery practices then environmental justice impacts would be a consideration. It would be

¹ The Clackamas River is a tributary to the Willamette River several hundred yards below Willamette Falls.

necessary to identify an analysis area and its characteristics.¹ Then connect the action being analyzed to how potential harm and benefits will impact the identified communities.² There are relevant impact categories that can be discussed for imaginary production actions: how hatcheries contribute to employment, food subsistence, and fish as a traditional cultural resources. Other impact categories that are indirectly related to environmental justice considerations are from hatchery operations requiring extensive electric power purchases, fresh water use, fish feed consumption, and are a pollution source (such as requiring holding pond discharge treatment). These other categories deserve mention but are not explored in this report.

Given the wide dispersal of State hatcheries and where fishing opportunities from releases occur, the analysis area adopted are county boundaries within the State. County boundaries should have sufficient granularity so as not to dilute or inflate discussed impacts. Special mention of tribal impacts (ecological, cultural, human health, economics) should be added to the more general population impact categories. Several relevant social and demographic characteristics for all 36 counties are shown on Table A.7 and for counties where State hatcheries are located on Table VI.1. For example, there would be concern if any of the hatchery located counties are determined to be minority (Native American or Hispanic) or low-income (families below poverty level) using criteria for percent minority, poverty rate, or income compared to the State reference area. All of the hatchery located counties meet the test except Clackamas (Clackamas Hatchery) and Deschutes (Fall River Hatchery). Jefferson County where Wizard Falls Hatchery is located has the highest percentage of Native American and Hispanic population, highest rural population and highest incidence of family poverty rate.

Hatchery intensity indexes are shown on Table VI.1. The salmon commercial pounds index is ranking of landings at ports summed to be within counties. Clatsop had the highest landings and Tillamook had the lowest of all counties that had landings in Oregon. The recreational fishing expenditures (travel and day trips in Runyan 2023) index are rankings (using five categories) of reported expenditures divided by county population. An index of 5 means the highest per capita expenditures and 1 means the lowest per capita expenditures. Many of the hatchery located counties had high index scores for recreational fishing.

In Oregon, the major landing harbors are located in Clatsop, Tillamook, Lincoln, Coos, and Curry counties. In recent years Newport and Coos Bay have had the highest salmon landings (PFMC

¹ Environmental justice State definition (ORS 182.535 Section 3) means the equal protection from environmental and health risks, fair treatment and meaningful involvement in decision making of all people regardless of race, color, national origin, immigration status, income or other identities with respect to the development, implementation and enforcement of environmental laws, regulations and policies that affect the environment in which people live, work, learn and practice spirituality and culture. There is a similar definition in federal laws: Executive Order 12898 and Title VI of the Civil Rights Act of 1964.

² "Environmental justice community" includes communities of color, communities experiencing lower incomes, communities experiencing health inequities, tribal communities, rural communities, remote communities, coastal communities, communities with limited infrastructure and other communities traditionally underrepresented in public processes and adversely harmed by environmental and health hazards, including seniors, youth and persons with disabilities (ORS 182.535 Section 4).

2023). The communities where these harbors are located are in lower than average income level counties. In 2021, per capital average personal income for the State was \$61,596. All of the affected coastal counties have average income levels less than \$55,000, with the exception of Coos County which was less than \$60,000. Jobs in the counties include employment in fishing industry occupations at harvesting and processing business. Many of the jobs are part-time and remuneration levels have a wide range. Remunerations are connected to catch levels since pay is a share of harvest value. Processing work occurs when processors receive fish deliveries. It can be assumed some fishing industry participant households are in the lower income levels. Any lessened commercial catch due to lessened hatchery production has the potential to affect those households.

The counties where hatcheries are located are rural with average income generally lower than statewide. While the jobs at the hatchery are skilled occupations with competitive wage levels, the multiplier effect of these jobs will mean occupations with lower wage levels can be affected. Recreational fishing trips motivated by hatchery fish abundance (expectation of satisfying catch rates) occur in the hatchery located counties. Recreational fishing economic impacts affect jobs in the visitor industry. Those jobs will be tiered with lower wage and salary level categories. Lessened hatchery production will lower angler spending due to lowered motivation to make trips. The lowered spending will potentially affect income being received by households of concern.

Hatchery programs distribute some collected fish to food banks or food share organizations. And if requested, will supply fish to tribes for ceremonial and subsistence purposes. The counties of concern benefit from the distribution and any lessened hatchery production will have adverse impacts.

All tribes in the analysis area could be impacted by changes in hatchery production. However, assessing these impacts from an environmental justice perspective would require input and information from those tribes and that investigation is beyond the scope of this analysis. The impacts to tribes from a cultural value perspective is addressed in this chapter's Section B.

Table VI.1
Hatchery Located Counties Social and Demographic Characteristics in 2021

County	State Hatcheries	Population	Per Capita Income	Population Percent					Rural Population	Individuals Below Poverty Level	Percent Housing Inadequate Plumbing	Percent Families in Poverty	Salmon Commercial Pounds Index	Recreation Fishing Expenditures Total Per Capita Index	
				Minority			Hispanic (all races)	Rural							Poverty Level
				Non-Hispanic											
				White	Native American	Other									
Clackamas	Clackamas	418,577	45,140	79.9%	0.4%	10.6%	9.1%	17.1%	7.5%	0.4%	5.0%	--	1		
Coos	Bandon	64,619	31,824	84.1%	1.9%	7.0%	6.9%	38.1%	16.3%	0.5%	11.7%	3	4		
Curry	Elk River	23,234	34,302	84.9%	1.3%	6.2%	7.7%	51.8%	13.2%	0.5%	7.9%	2	4		
Deschutes	Fall River	194,964	40,778	86.0%	0.5%	5.1%	8.3%	29.2%	9.4%	0.4%	6.0%	--	3		
Douglas	Rock Creek	110,680	28,293	86.3%	0.9%	6.6%	6.2%	40.4%	13.8%	0.8%	9.1%	--	3		
Jefferson	Wizard Falls	24,232	28,140	57.1%	13.0%	9.3%	20.6%	67.0%	14.9%	1.2%	13.7%	--	3		
Klamath	Klamath	68,899	27,701	76.0%	3.1%	6.9%	13.9%	37.8%	19.1%	0.7%	13.0%	--	3		
Lincoln	Alsea, Salmon River	49,866	32,776	80.8%	2.0%	7.5%	9.7%	38.0%	13.8%	0.5%	8.4%	4	5		
Linn	Roaring River	127,200	29,598	83.7%	0.6%	6.1%	9.7%	34.2%	11.8%	0.4%	7.2%	--	2		
Tillamook	Cedar Creek, Nehalem, Trask	27,129	31,501	83.3%	0.8%	5.3%	10.6%	60.7%	13.6%	0.3%	9.2%	1	5		
Wasco	Oak Springs	26,603	33,982	73.2%	2.4%	5.0%	19.4%	34.8%	9.7%	0.3%	5.4%	--	5		
State		4,207,177	37,816	74.1%	0.8%	11.6%	13.6%	19.5%	12.1%	0.5%	7.5%	0	2		

- Notes: 1. Salmon commercial pounds index is ranking of landings at ports summed to be within counties. Clatsop had the highest landings and Tillamook had the lowest of all counties that had landings in Oregon.
2. Recreational fishing expenditures (travel and day trips) index are rankings (using five categories) of reported expenditures divided by county population. An index of 5 means the highest per capita expenditures and 1 means the lowest per capita expenditures.

VII. Sustainable Funding

A. Financing Options

The primary purpose of the economic analysis was to show the economic value from enhanced fishing opportunities due to State owned hatchery production. Values include economic effects from hatchery visitation and hatchery operations. A review of hatchery budget revenue sources and cost trends raised questions about State hatchery operation's financial stability. Chapter II discusses the pending financing crunch from decreasing revenues from license and fee sales and increasing costs of production all the while trying to satisfy objectives for constant production. This chapter provides an identification of possible financing techniques to deal with the crunch. Discussions delve a little deeper into price increase for fisheries access fees. The discussions are brief and are presented without recommended prescriptive actions.

It is suggested that a hatchery financing planning study be undertaken that will offer a range of feasible alternatives accompanied with social and economic impact analysis. The options identification and brief discussions in this report is not sufficient review for financing plan decision making. The alternatives would include a variety of methods other than just traditional sources of income secured through biennium legislature approved budgets. The methods could address: (1) increasing revenues from existing sources (e.g. through greater general fund appropriations or higher license and fee prices); (2) establishing increasing revenues from new sources (e.g. special mitigation or land/water development assessments); (3) increasing efficiencies or lowering production levels to lower costs; and/or (4) shifting production responsibilities to other levels of government, public-private ventures, or other entities (e.g. tribes, STEP organizations, etc.).

As the ODFW mission evolves to reflect the public's growing concern regarding natural resource protection (ODFW and OCRF 2023), existing hatchery objectives and programs should be reviewed for better alignment with fund source purpose. For hatchery production consumptive uses, there may be a need to place more emphasis on local fishing opportunities. In such case, there may be avenues for increased funding for hatchery based programs through license and fee increases such as spatial-based harvest cards. General revenue funds may be the more relevant funding source when raising priority for hatchery conservation programs aimed at sustaining species.¹ General fund justification is also from the other non-consumptive hatchery benefits such as the economic benefit to rural underserved communities and providing education opportunities.

When it can be shown hatchery public benefits (such as from rearing fish for conservation purposes) compared to fisheries direct use benefits are high, then there can be more acceptance for general fund and even innovative financing techniques. An example innovative

¹ The ODFW Hatchery Management Policy (OAR 635-007-0542) provides general fish culture and facility guidelines. The policy describes best management practices that are intended to help ensure the conservation of both naturally produced native fish and hatchery produced fish.

financing technique might be securing dedicated funding from sumptuary taxes or lottery fund distribution. Both examples have voter-approved beneficiary distributions and a legal interpretation would be necessary to show hatchery funding qualifies within an existing distribution category. Using findings in this report shows hatchery operations have major REI therefore hatchery support might satisfy qualifying criteria for lottery fund economic development distribution. Another example innovative technique is related to mitigation. Where future water and land development actions (such as energy generation or major industry siting) have a purported connection to fish resource recovery or fisheries interruption, siting approval mitigation agreements for hatchery funding might be justified. Whether or not there is fish recovery hindrance or fisheries impacts, development sponsors may appreciate the positive public relations benefits from the extra taxation.

The suggested financing planning study would use analytical procedures to identify opportunities, constraints and payoffs from applying innovative techniques in specific situations.¹ The new study scope would include descriptions of the advantages and disadvantages of each financing approach. The planning study would review optimizing assets in concert with recommended facility efficiency improvements. For example, increasing operation scales through centralization may show fish transfer costs can be decreased.

To help envision a financing planning study scope, an evaluation matrix is provided for example techniques that fall within the above mentioned four methods (Table VII.1). The listing of example financing sources is grouped to hatchery objectives (conservation, fisheries enhancement, mitigation), benefaction and hatchery management (such as public-private cooperative agreements).² Evaluation results for implementation promise are shown using criteria for financing capacity, institutional feasibility and probable private/public acceptance. Each technique's potentiality assessment is provided using circled filled icons. Readers' own scoring is encouraged to add critical thinking about how the pending financing crunch can be overcome with more sustainable funding. Offering this evaluation matrix only highlights considerations for applying the techniques and does not supplant the necessity for detailed analysis and impact explanations.

Not all of the identified techniques are necessarily used in Oregon nor at other states for hatchery operation and capital improvement financing. While all seem workable, the selected options to pursue need additional review for legality and whether there is upfront political support. Most will need to be elevated to legislative statutory review for implementation. Using the shown evaluation criteria, the most promising is increasing license and fee prices. Even for that option, the financing technique should have additional review for increased price market

¹ Investigating innovative financing techniques should include identifying “free riders.” Is there a sector or group benefiting from hatchery production but not providing an equitable share of support? A free rider example is the discounted license and fee schedule based on age. The discounts are legislative decisions and the subsidy is borne by other hatchery revenue sources such as licenses and fees paid by fisheries direct users.

² OAR 635-009-0410 recognizes there may be a Cooperative Salmon Hatchery Program approach to hatchery production in order to provide harvest opportunities for Oregon’s citizens. The approach may be a way to develop new sources of revenue or support for hatchery production.

tolerance. Following sections in this report discuss the license and fee price increase option in more detail.

Discussions about funding techniques in this chapter do not have an all-hatchery system wide perspective. It is a myopic look at sourcing funds more aligned with State hatchery benefiteres. There could be consequences from changing license and fee price structures even with mechanisms designed to target fisheries direct users. The suggested financing planning study would more appropriately have the system wide scope. At that level, there could be better accounting for how centralized services (headquarter administration, coordination and support) are shared among all hatcheries.

B. Current Funding Issues

State owned hatcheries primary purpose is to enhance Oregon fishing opportunities. To that end, it is expected funding should reflect support from those that benefit (Trushenski June 2018).¹ Benefiteres would include in no particular order: (1) commercial and recreational fishing participants, (2) tribes using fish for C&S, (3) local entities and organizations appreciating the education opportunities and economic development aspects from local hatchery operations, and (4) the public concerned about fish species conservation. Moving towards sustainable hatchery funding can mean not only fiscal adaptation to better balance benefiter funding, but also will mean emphasis that hatchery operation services are being delivered with highest efficiency given trending environmental conditions. Climate change causing new environmental conditions will require planning and provision for new facilities and operations.

Other State hatchery review contractors are addressing facility and operations actions needed for making efficiency gains, taking care of deferred maintenance items, and addressing climate change challenges. This chapter discusses fiscal adaptation possibilities for hatchery sustainable funding. Flows from general fund support is a central issue because of the tradeoff use of those funds for other State government services. Better aligning benefiter support requires looking at mechanisms to better extract equitable payments to financially support enhancement hatcheries. A review of other surrounding states hatchery financing is included to discern if there is a better financing template.

The general fund revenue support for all ODFW managed hatcheries is eight percent (Table II.1) and 22 percent for the 14 State owned hatcheries (Table II.2). License and fees revenue support are 13 percent and 52 percent, respectively. The balance of revenue support is federal and other external programs. While use of general funds is justified because fish being produced is a public resource, the fisheries direct active use benefiteres are mostly an isolated society segment. There is the view that benefiteres should have a higher stake in the funding from which

¹ The concept of a “user-pays, public-benefits” program in which those who consumptively use the resource pay for the privilege is the funding approach promulgated by The American System of Conservation Funding. Additional information about the program is at: <https://www.fishwildlife.org/afwa-informs/resources/american-system-conservation-funding>.

their proportion of benefits is being derived. If State hatcheries general fund support is eliminated, the deficit for the model year is \$2.7 million assuming all other funding source amounts are constant.

C. Surrounding States' Hatchery Funding

Surrounding state hatchery funding is not unlike Oregon's approach with a mix of state derived revenue combined with federal and external sources. (See Appendix C for surrounding state hatchery locations and budgets.) Each state uses a hatchery cost center to track revenue distribution and operating expenditures. The following summaries are states' hatchery budget amounts and production levels. The budgets do not include depreciation or annual capital contributions. The descriptions are not inclusive of federal (not operated by states) nor tribal hatcheries. The summaries include descriptions for major capital improvement funding approaches. Example recreational license and harvest card current price are provided. Like Oregon, there are other endorsement and fisheries access fees at the other states.

- Washington Department of Fish and Wildlife (WDFW) operates 80 hatcheries including ancillary facilities with total FY 2024 budget \$69 million. Revenues are State general fund 36 percent, local government and utility districts 23 percent, federal 26 percent and other 15 percent. (Washington State statewide and local government general fund is primarily from sales and use taxes.) When fisheries related license and fee revenues are itemized, the revenues are 11 percent of total hatchery production costs. The majority of local funding contracts are mitigation based, but there are some driven by conservation and tribal co-management responsibilities. These non-mitigation contracts are for specific propagation programs and services such as marking and tagging. Another example of non-mitigation local funding contract is a cooperative agreement with a non-profit entity for a trout hatchery. Total anadromous and resident fish target releases were 187 million and 16 million respectively in 2023. The current angling resident license and salmon/steelhead harvest card fees are \$69.55 and \$12.60.

Hatchery heavy maintenance and facility improvement funding is usually through legislature appropriations for individual projects using the State's bonding capacity. Federal sources are exploited when available. For example, the current budget includes a large Inflation Reduction Act (IRA) grant for two major improvements at Mitchell Act funded hatcheries.

- Idaho Department of Fish and Game (IDFG) operates 19 hatcheries that had a FY 2024 budget of \$18 million. There was no State general fund support. Licenses and fee revenues are 32 percent and the balance is federal. Hatchery target releases in 2023 were 30 million anadromous and trout species. The current angling resident license and salmon/steelhead harvest card fees are \$30.50 and \$15.25.

Funding for hatchery improvements varies on whether it is an anadromous or resident fish hatchery. Improvements to resident fish hatcheries are primarily funded with IDFG

license funds. Five dollars from each fishing license sold is earmarked for construction, repair, or rehabilitation of state fish hatcheries, fishing lakes or reservoirs, or for fishing access. There is a base (recurring annual) appropriation to spend license dollars on deferred maintenance at hatcheries. Improvements to anadromous fish hatcheries are funded from a couple of sources in addition to license funds. Federal funded hatcheries include support from such programs as BPA, SRA, and LSRCP. There are other anadromous non-federal funded hatcheries such as those supported by the Idaho Power Company (IPC). IDFG works with the federal and non-federal entities to implement hatchery improvements when needed. Major improvements to anadromous fish hatcheries may require a request for legislative appropriation to spend the federal or non-federal funds.

- California Department of Fish and Wildlife (CDFW) operates 22 hatcheries. Their FY 2024 budget is \$52 million. State general fund support is about 12 percent and fishing license fee support (California Hatchery and Inland Fisheries Fund) is 50 percent. Hatchery target releases for 2024 are 48 million total (38 million anadromous and 10 million trout). Statutes require one-third of all sport fishing license fees collected to be used for hatchery operations. The current angling resident license and salmon/steelhead harvest card fees are \$61.82 and \$18.36.

Major hatchery improvements are funded through a variety of sources. There have been significant one-time general fund appropriations in the last few years. There also has been a variety of bond funding for hatchery upgrades/construction in the past. CDFW also utilizes Fish and Game Preservation Fund, Hatchery and Inland Fisheries Fund, and Federal Funds to make hatchery improvements. Any type of alternative funding typically still requires legislative action/approval for CDFW to receive the required appropriation authority to bring in the funds and/or expend them.

Each surrounding state's hatchery objectives have overlays for mitigation, fisheries augmentation, and stock conservation. Hatchery size and species production varies widely. WDFW production alone is more than ODFW, IDFG and CDFW combined. WDFW has the most diverse funding sources compared to the other surrounding states. Funding does have comparatively high support from general funds and mitigation. There is a WDFW example for non-profit entity funding support. IDFG emphasizes no general funds are used for hatchery operations (personal communication August 2024). CDFW treats general fund revenue with flexibility. In some years, the line item has been negative when other line items have unexpected higher amounts than budgeted. The three surrounding states financing templates are specific to a state's taxation policies, mitigation driven responsibilities and/or are similar to ODFW budgeting. While specific, the financing structures can be illuminating for showing a modified ODFW approach to State hatchery funding requirements.

D. Financing Option for Increasing Fisheries Direct User Payments

This section's discussion for sustainable funding does not address an assignment of hatchery costs among all beneficiaries. The discussion only addresses how fisheries direct user beneficiary revenue generation mechanisms might be relied upon for increased revenue. It is noted license and fee revenue reliability is a concern since angling per capita participation has been on a downward trend and increased license costs could exacerbate the reduced demand (ODFW October 2023(b), Four Peaks August 2024).

Assigning fisheries direct user or other beneficiaries funding responsibilities would be consistent with the well-established utility principle of cost recovery. This thinking suggests an apportionment of hatchery costs would correspond with benefits received. This would spread support liabilities among fisheries direct users (e.g. through licenses and fees), special interest groups (e.g. non-profit entities, tribes, etc.), and the public (e.g. through the general fund revenue source). The links to public benefits from enhancement hatchery production is through fisheries direct user downstream positive economic effects (i.e. multiplier effects) and conservation values balanced against adverse impacts to wild stocks.¹

The spread of fisheries direct user funding responsibilities is shown in the following table (based on numbers from Table VII.2). Commercial and recreational sector funding liabilities are proportioned to benefits received (NEV) or associated with fisheries production cost (cost per harvested adult times catch).

Fisheries	Associated Funding Liability	
	Proportion of Benefits Received	Production Costs
Commercial		
Anadromous	0.1%	0.1%
Recreation		
Anadromous	33.1%	59.7%
Trout	66.8%	40.1%

The association shows the high recreation fisheries participants singular liability responsibilities. A funding issue is the overlapping responsibility when anglers participate in both anadromous and trout fisheries. Anadromous fisheries are more specialized in gear and fishing modes and more expensive to pursue (trip costs). There are revenue generation mechanisms that could target the fishery such as through prices and features on harvest cards to avoid penalizing the non-anadromous fishery participants.

¹ Without in-depth research, it would be conjecture on the sign (positive or negative) and magnitude of enhancement hatchery public benefits when adverse impacts to wild stocks balanced with conservation benefits from supplementation and restoration are considered. Regardless, it is recognized enhancement hatcheries have social and economic benefits from preserving fishable stocks, community economic development from angler and hatchery spending, contributions to tribal interests, and the provision of education opportunities.

The current example angling license price and sales activity in 2023 is resident \$44 with 201,775 sold. There are many other nonresident, age, hunting combination, and term angling license types. Figure VII.1 shows real dollar angling license and fees revenue generation trends from 2014 to 2023.¹ The figure shows the price increases that have occurred during that period. Angling license and fee per capita sales have been decreasing in recent years except for a COVID related bump-up in years 2020 and 2021. Increased fishing activity during COVID years was associated with stress relief and driven by the perceived safety of social fish distancing (Midway et al. 2021). State population increases have helped maintain absolute revenue trends.

There was a surcharge imposed on angling license fees in 1989 by the legislature to fund the restoration and enhancement (R&E) Program. The R&E Program provides benefits to all of Oregon's fish species, both freshwater and marine, that provide recreation and commercial fishing opportunities (ODFW 2023c). The angling license surcharge ranges from \$1 to \$10 depending on residency of other license types. There is also a commercial gillnetting and troll fishing permits fee (\$74 and \$65, respectively) and landing fee (\$0.04 per pound) dedicated to R&E Program (see below commercial fishing taxation discussion). The fees have raised on the order of \$2.2 million annually depending on license sales and anadromous fish commercial landings. The Oregon hatchery system has been a major recipient of the R&E Program funds. (See Table B.4 for a recent list of State hatchery improvement projects funded by the R&E Program.)

Trout fishing is pervasive across the state. The most obvious mechanism to increase revenue would be a surcharge on an angling license although other possibilities exist such as a new harvest card.

For recreation anadromous fisheries, Oregon has a combined (salmon/steelhead, sturgeon, halibut) angling tag with the following example price and sale activity in 2023: \$46 resident and 106,651 sold. The tag authorizes wild/hatchery harvest of 20 salmon or steelhead per year. There is also a salmon/steelhead hatchery harvest tag with 2023 sale activity: \$33 resident and 6,547 sold. The tag is to be used for hatchery harvests greater than 20 fish per year. The harvest tag sales from all harvest tag types excluding SportsPac sales was \$5.7 million in 2023. An increased revenue financing mechanism could be changing the cost on one or each of the tags. For an example when not considering price elasticity, a 20 percent increase on all tags would raise an additional \$1.1 million in 2023. If purchase of the hatchery tag was mandatory for resident and non-resident combination tag holders at same price with inelastic demand, the amount raised would be an additional \$3.6 million in 2023.

There is very little revenue generation liability that is associated with commercial fisheries. The State hatchery commercial fisheries harvest sector DV is \$384 thousand which was five percent

¹ National and state level trends in fishing license holders and sales is at a U.S. Fish and Wildlife Service (USFWS) maintained website. An interactive dashboard provides options for showing trends nationally and for each state. Use Internet search keywords "USFWS Dashboard License and Apportionment Data" without quotes to find the website.

of total salmon fisheries harvest value in 2021 (2023 dollars). The commercial salmon fisheries have an ad valorem fee (3.15 percent). The fisheries also have salmon and steelhead poundage fees for R&E five cents per round pound and an Oregon Hatchery Research Center (OHRC) four cents per round pound. The revenue raised from all commercial salmon and steelhead landings in Year 2021 (expressed in 2023 dollars) for the ad valorem, R&E, and OHRC was \$228 thousand, \$90 thousand, and \$72 thousand respectively. The State hatcheries associated liability would be \$12 thousand, \$5 thousand, and \$4 thousand respectively. It would only be necessary to redirect all salmon and steelhead ad valorem fee a minimal amount to satisfy the commercial fisheries liability.

Targeting fisheries direct users to raise funds dedicated to hatcheries will be controversial. There will be duplicity criticism because angling license and fees have already been surcharged to be used partially for hatchery improvements. Market sensitivity for price increases will be tested. Existing license and fee prices are comparable in Washington and California which may signal maximum price acceptance. A roll-out of price increases would be better received if connected to commensurate costs being incurred and/or shown to have demonstrated loss of other revenue sources. It will help if there is additional information about the increased responsibilities for how ODFW is embracing stewardship and innovation to address operation challenges, hatchery reform, and climate change.

Previously discussed findings show high WTP values per fish and in aggregate (Table V.3). The political will to shift funding burden could rely on those findings, but there will still be stakeholder resistance to raising fees. Fisheries direct users are habituated to comparatively low cost access to fish resources. There will be arguments promulgated that users pay in other ways that make their existing share equitable (for example State income taxes, gas taxes, excise taxes on fishing gear and boats, etc.). There is a significant imbalance between the hatchery production cost per harvested fish and any direct and indirect layered fisheries access fee accounting (Table III.3). Taking steps to resolve the imbalance through benefiter fee increases will make further progress for enhancement hatchery sustainable funding.

The license and fee financing examination assumes State hatcheries will continue to be primarily for fisheries enhancement. Given research findings about the impact of mixing hatchery and wild stocks, it could be there will be policy questioning about State hatchery objectives. If wild populations continue to decline and stressed under climate change, using hatchery production effectively to sustain natural salmon production, provide fishing opportunities, and meet public values will become increasingly important (Terui et al. 2023).

License and fee revenue is distributed across many programs to carry out ODFW missions. It could be marketing studies would show that fisheries participant extracted revenue has maximized (due to price elasticity). In this case, it will be necessary to pursue other hatchery financing options as well as exploring reprioritization for how license and fee revenue is shared across programs.

E. Funding Discussion

A broad range of financing options have been identified. Pursuing any of the techniques will need to be intensively investigated and vetted by stakeholder groups. Ultimately the changed financing approach will need Oregon Fish and Wildlife Commission approval and legislative action. Any increased fisheries access fees would need to be reviewed for distributional impacts and environmental justice. A concern is that it will be regressive taxation harming proportionally more low-income households.

The review of existing license and fee schedules shows the modest changes that would be needed for general fund replacement funding. The example is for status quo State hatchery financing and does not take into consideration other methods to preserve fisheries opportunities. The other methods could be through a combination of fisheries management changes, making habitat improvements, and continued hatchery reform leading to increased wild fish production. Only reviewing the status quo does not include what might be savings from individual hatchery closings nor throttling hatchery production.

The realities of the fiscal situation is falling revenues from the license and fee revenue source, increasing hatchery operation costs, and facilities reaching their life cycle end. The hatchery financing crunch is giving urgency to making system strategic planning decisions. Finding a combination of methods to increase revenue will not be straightforward. Estimating the amount of increased funding is complicated by any other funding sources having variability. Federal funds can change depending on national spending policies. While general funds are accompanied with scrutiny, they are a dependable source subject to continued biennium legislature approved budgets.

It was suggested a hatchery financing planning study be undertaken that offers a range of feasible alternatives that are accompanied with social and economic impact analysis. A financing options evaluation matrix was provided with only brief discussion about methods and results. Offering the matrix highlights considerations for implementing the options, but is not a substitute for necessary detailed analysis and impact explanations. More decision making information about option packaging is necessary.

Table VII.1
Sustainable Funding Option Considerations

Financing Options, Grouped	Consideration	Evaluation Criteria		
		Financing Capacity	Institutional Feasibility	Private/public Acceptance
<u>Conservation</u>				
General fund	Investments should be tied to conservation objectives; abstract value measurements for getting public support	●	●	◐
Lottery fund	Requires resetting allocations if dedicated for hatchery O&M; competitive with other allocation recipients; already used for ODFW non-hatchery services (management, monitoring, permitting, coordination, etc.)	◐	○	◐
Sumptuary taxes	Misdirected environmental taxation; concern regressive tax that discriminates against lower class	◐	◐	○
<u>Enhancement</u>				
License/harvest card	Priority for other ODFW functions; price elasticity concerns if price increased; already surcharged for hatchery capital improvements	◐	●	◐
Community (funding)	Unprecedented for other than mitigation; justified for hatchery local education opportunity and economic development benefits	◐	◐	◐
Tribes	Co-management and cooperative agreements for operations possible; facilities typically tribal ownership	●	◐	◐
<u>Mitigation</u>				
Habitat degradation	May require revisiting past arrangements for land developments and water withdrawals; potential for one-time development fees	◐	○	◐
Fisheries interruption	Example new energy generation and transmission facilities; requires burden of proof for impacts	◐	○	◐
<u>Benefaction</u>				
Perpetual	Endowments can legally restrict donated funds for certain uses	○	◐	◐
One-off	Not appropriate for ongoing O&M, more relatable to capital improvements.	○	◐	◐
<u>Management</u>				
Public-private venture	Cost effectiveness questions	◐	◐	◐
Other entity operate	Requires training and monitoring	◐	○	◐

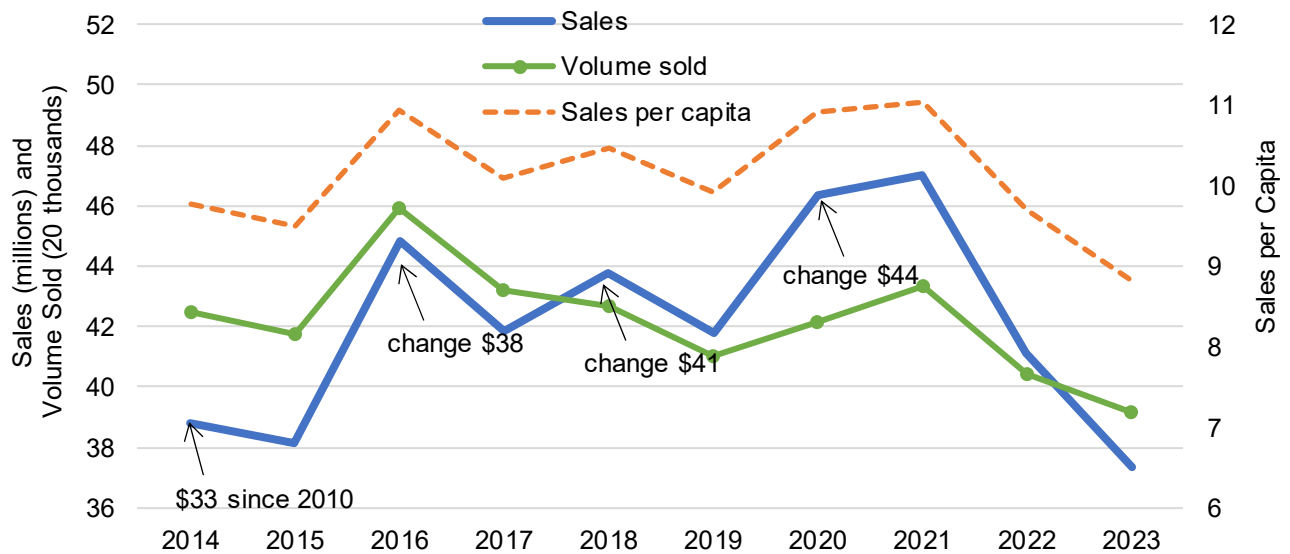
Evaluation Criteria	Legend for Potential
Financing capacity - dependable amounts for ongoing O&M costs.	● High
Institutional feasibility - successful statutory review, passes legal interpretations, has precedence	◐ Moderate
Private/public acceptance - probable positive feedback from industry and fisheries representatives	◐ Perhaps
	◐ Unlikely
	○ Low

Table VII.2
Hatchery Fisheries Benefiter Funding Liability Associated with
Proportion of Benefits Received and Production Costs

Benefiter	Anadromous		Trout		Total			
	NEV	Costs	NEV	Costs	NEV	Costs		
Commercial	51.3	0.1%	24.4	0.1%	-	-	51.3	24.4
Recreation	20,546.6	33.1%	9,766.4	59.7%	41,531.5	66.8%	62,078.1	16,325.3
Total welfare	20,597.9		41,531.5		62,129.4			
Total costs	9,790.8		6,558.9		16,349.7			

- Notes: 1. NEV and production costs are thousands 2023 dollars.
2. NEV from Table V.1 and costs are from Table II.4.

Figure VII.1
Angling License and Tag Sales with Price Changes in 2014 to 2023



- Notes: 1. Absolute and per capita sales are real 2023 dollars.
2. Shown sales revenue includes all resident and non-resident licenses for basic angling licenses, youth and senior licenses, resident and non-resident uniformed services licenses, all daily and multiple day licenses, all harvest and hatchery harvest tags, two-rod endorsement, and all SportsPac and combination (license/tag) licenses. There are other required endorsement and access fee revenue not included.
3. Annotated license price change years are for basic resident angling license. Other license and tag prices generally changed on those dates.

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Appendix A
Economic Analysis Model Inputs

Table A.1
 Fisheries Recreational Success Rates

	Anadromous Species				
	Fall	Spring/Sum		Winter	Summer
	Chinook	Chinook	Coho	Steelhead	Steelhead
Success rates					
Coast inland	6.00	7.50	15.00	4.00	4.00
Columbia River	3.19	11.45	3.19	3.19	3.19
Ocean	7.47	7.47	1.67	--	--
Success rates for trout by hatchery					
<u>Hatchery</u>				<u>2005</u>	
Cedar Creek	legals			0.42	
Nehalem	legals			0.42	
	trophy			1.05	
Alsea	legals			0.42	
	trophy			1.05	
Bandon	trophy			1.05	
Elk River	legals			0.32	
	trophy			1.05	
Salmon River	legals			0.42	
Rock Creek	legals			0.32	
	trophy			1.05	

- Notes: 1. Success rates are expressed as number of days per fish retained.
 2. Trout CPUE is a function of site release quantity in days per fish.

Sources: TRG (June 2024) for coast inland [7]; TRG (November 2014) for Columbia River [8]; PFMC (February 2024) for ocean Chinook and coho (weighted average 2013-2022) [6]. ODFW (2014) for trout [5].

Table A.2
Hatchery Rearing Life Cycle Duration and Growth Size

Species	Life Cycle	Release Size (fpp)	Transfer/Release Duration (months)
Trout	Eyed-eggs		3
	Fingerlings	200	10
	Legal	2-3	22
	Trophy	0.5	34
Steelhead summer	Eyed-eggs		3
	Fingerlings	200	6
	Smolt	4-6	18
Steelhead winter	Eyed-eggs		3
	Fingerlings	200	5
	Smolt	4-6	16
Fall Chinook (pre-smolts)	Green eggs		2
	Eyed-eggs		3
	Fingerlings	200	6
	Pre-smolt	75	8
Fall Chinook (smolts)	Green eggs		2
	Eyed-eggs		3
	Fingerlings	200	6
	Smolt	12-18	11
Spring Chinook (sub-yearling)	Green eggs		2
	Eyed-eggs		3
	Fingerlings	200	8
	Smolt	12	13
Spring Chinook (yearling)	Eyed-eggs		3
	Fingerlings	200	8
	Smolt	10	20
Coho	Smolt	10-15	18

Notes: 1. Timing is months in an artificial propagation environment to reach shown sizes. (The months are not additive for a species.)

2. Growth times size are highly dependent on water temperature and other environmental conditions so a range would be a better characterization.

Source: ODFW personal communication May 2024 [12].

Table A.3
Recreational Regional Economic Impact Per Angler Day

	Anadromous	
	<u>Trout</u>	<u>Species</u>
Economic contributions per angler day		
Coast inland	56.81	58.59
Columbia River		83.46
Ocean		63.08

Notes: 1. Economic contributions are expressed as income adjusted to Year 2023 dollars using the GDPIPD.

Sources: TRG (May 2014) for anadromous coast inland [21]; ODFW (2014) for trout coast inland [22]; TRG (November 2014) for Columbia River [20]; PFMC (February 2024) for ocean [17].

Table A.4
Commercial Ocean Regional Economic Impact Per Pound and Columbia River Prices

	Anadromous Species				
	Fall Chinook	Spring/Sum Chinook	Coho	Winter Steelhead	Summer Steelhead
Ocean (Oregon landings) Pounds per fish	11.91	11.91	5.73	--	--

Notes: 1. Pounds are average dressed weight for 2013-2022 seasons.

Source: PFMC (February 2024) [10].

Ocean (Oregon landings) Economic impacts per pound in 2021:					2021\$	2023\$
			Per Dollar		Impacts	Impacts
	Volume	Value	Multiplier	Impacts	Per Pound	Per Pound
Salmon, fixed gear	266,808	2,254,148	1.82	4,108,687	15.40	17.08
Troll coho	14,760	52,883	1.82	96,391	6.53	7.25
Troll Chinook	252,026	2,201,219	1.82	4,012,212	15.92	17.66

Notes: 1. Economic contributions are expressed as personal income adjusted to Year 2023 dollars using the GDPIPD.

Source: TRG (June 2024) [18].

	Anadromous Species				
	Fall Chinook	Spring/Sum Chinook	Coho	Winter Steelhead	Summer Steelhead
Columbia River, Oregon side Price (2023\$)	2.38	8.09	1.37	1.66	1.66

Sources: TRG (November 2014) for Columbia River REI per fish, updated to 2023 prices from TRG (June 2024) [19].

	Anadromous Species				
	Fall Chinook	Spring/Sum Chinook	Coho	Winter Steelhead	Summer Steelhead
Ocean (Oregon landings) Pounds per fish for NEV	11.40	11.40	6.50	--	--

Notes: 1. Pounds are average dressed weight for 2023 season.

Source: PFMC (February 2024) [10].

Columbia River Pounds per fish for NEV	18.36	18.36	7.47	--	--
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Source: TRG (November 2014) [11].

Table A.5
Hatchery Fisheries Regional Economic Impact Per Harvested Adult by Species

	Total	Trout	Anadromous Species					
			Subtotal	Fall Chinook	Spring/Sum Chinook	Coho	Winter Steelhead	Summer Steelhead
REI per fish average								
Freshwater								
Recreational, coast inland		24		223	439	223	234	234
Recreational, Columbia R.		24		223	955	223	266	266
Commercial, Columbia R.		--		80	246	18	161	161
Ocean								
Commercial		--		210	210	42	--	--
Recreational		--		83	471	83	0	0
All fisheries freshwater and ocean	35	24	193	215	466	61	240	244

- Notes: 1. REI expressed as labor income in 2023 dollars.
2. Harvested adults are attributed catch in Oregon fisheries.
3. Recreational ocean and freshwater coho and fall Chinook are coincident fisheries. The literature provided REI is per experience (angler day) without regard to different effort or expenditures necessary for singularly pursued species.

Source: Recreational ocean REI per day: PFMC (February 2024) [17]; recreational salmon/steelhead inland REI per day: TRG (June 2024) [21]; trout REI per day: Upton (January 2006) [22]; trout CPUE: Upton (January 2006) [5]; anadromous ocean CPUE: PFMC (February 2024) [6]; anadromous inland CPUE: TRG (June 2024) [7]; anadromous Columbia River CPUE: TRG (November 2014) [8]; and attributed harvest from study.

Table A.6
Hatchery Fisheries Net Economic Value Per Harvested Adult by Species

	Total	Trout	Anadromous Species					
			Subtotal	Fall Chinook	Spring/Sum Chinook	Coho	Winter Steelhead	Summer Steelhead
NEV per fish average								
Freshwater								
Recreational, coast inland		39		370	730	370	389	389
Recreational, Columbia R.		39		370	1,114	370	310	310
Commercial, Columbia R.		--		6	17	2	0	0
Ocean								
Recreational		--		128	727	128	--	--
Commercial		--		10	10	3	--	--
NEV per harvested adult freshwater and ocean	55	39	289	333	680	78	375	365

- Notes: 1. NEV is recreational angler WTP and commercial salmon fishery profits (including harvest and processing sectors).
2. Harvested adults are attributed catch in Oregon fisheries.
3. Recreational ocean and freshwater coho and fall Chinook are coincident fisheries. The literature provided NEV is per experience (angler day) without regard to different WTP for singularly pursued species.

Source: Recreational salmon/steelhead fishing NEV per day: Rosenberger (November 2018) [27]; recreational trout fishing NEV per day: USFWS (January 2016) [28]; trout CPUE: Upton (January 2006) [5]; anadromous ocean CPUE: PFM (February 2024) [6]; anadromous inland CPUE: TRG (June 2024) [7]; anadromous Columbia River CPUE: TRG (November 2014) [8]; and attributed harvest from study.

Table A.7
Counties (All) Social and Demographic Characteristics in 2021

County	State	Hatcheries	Population Percent										Salmon Commercial Pounds Index	Recreation Fishing Expenditures Total Per Capita Index
			Population	Per Capita Income	Minority			Rural Population	Individuals Below Poverty Level	Percent Housing With Inadequate Plumbing	Percent Families in Poverty			
					Non-Hispanic									
					White	American Native	Hispanic Other (all races)							
Baker		16,539	29,463	89.6%	1.4%	4.2%	4.8%	41.4%	14.1%	1.0%	10.0%	--	4	
Benton		94,667	37,287	79.2%	0.4%	12.5%	7.9%	19.4%	18.3%	0.1%	7.5%	--	1	
Clackamas	*	418,577	45,140	79.9%	0.4%	10.6%	9.1%	17.1%	7.5%	0.4%	5.0%	--	1	
Clatsop		40,720	34,387	82.9%	0.6%	7.6%	8.9%	39.1%	9.9%	0.2%	4.5%	5	4	
Columbia		52,381	34,347	86.4%	0.8%	7.0%	5.7%	41.2%	10.1%	0.5%	6.2%	--	1	
Coos	*	64,619	31,824	84.1%	1.9%	7.0%	6.9%	38.1%	16.3%	0.5%	11.7%	3	4	
Crook		24,300	33,431	87.3%	1.3%	3.5%	7.9%	49.8%	9.6%	0.4%	6.0%	--	3	
Curry	*	23,234	34,302	84.9%	1.3%	6.2%	7.7%	51.8%	13.2%	0.5%	7.9%	2	4	
Deschutes	*	194,964	40,778	86.0%	0.5%	5.1%	8.3%	29.2%	9.4%	0.4%	6.0%	--	3	
Douglas	*	110,680	28,293	86.3%	0.9%	6.6%	6.2%	40.4%	13.8%	0.8%	9.1%	--	3	
Gilliam		1,954	30,182	87.4%	2.1%	5.5%	5.0%	100.0%	11.8%	0.2%	1.5%	--	--	
Grant		7,225	30,352	90.0%	1.0%	4.7%	4.3%	100.0%	15.4%	0.8%	7.7%	--	5	
Harney		7,454	24,599	86.1%	1.1%	7.3%	5.5%	44.4%	11.7%	0.1%	3.4%	--	4	
Hood River		23,915	39,176	61.9%	0.3%	6.0%	31.8%	51.8%	6.3%	0.5%	3.4%	--	4	
Jackson		221,662	33,346	79.2%	0.7%	6.4%	13.7%	20.6%	13.5%	0.3%	8.4%	--	2	
Jefferson	*	24,232	28,140	57.1%	13.0%	9.3%	20.6%	67.0%	14.9%	1.2%	13.7%	--	3	
Josephine		87,686	29,260	85.2%	0.6%	6.3%	7.9%	43.1%	16.1%	0.9%	11.9%	--	2	
Klamath	*	68,899	27,701	76.0%	3.1%	6.9%	13.9%	37.8%	19.1%	0.7%	13.0%	--	3	
Lake		8,119	27,093	82.4%	2.2%	6.2%	9.2%	100.0%	19.1%	1.7%	13.4%	--	4	
Lane		380,532	33,517	80.7%	0.6%	9.3%	9.4%	18.0%	16.5%	0.4%	8.9%	--	2	
Lincoln	**	49,866	32,776	80.8%	2.0%	7.5%	9.7%	38.0%	13.8%	0.5%	8.4%	4	5	
Linn	*	127,200	29,598	83.7%	0.6%	6.1%	9.7%	34.2%	11.8%	0.4%	7.2%	--	2	
Malheur		31,313	20,436	60.0%	0.9%	4.3%	34.7%	58.9%	19.4%	0.3%	14.6%	--	3	
Marion		344,037	30,591	63.4%	0.5%	8.6%	27.5%	15.4%	13.4%	0.5%	9.4%	--	1	
Morrow		11,964	28,223	57.7%	0.3%	4.2%	37.8%	100.0%	14.8%	0.2%	11.5%	--	3	
Multnomah		810,011	44,675	68.1%	0.6%	19.2%	12.1%	1.3%	12.7%	0.6%	7.5%	--	1	
Polk		86,347	34,858	76.6%	1.5%	7.2%	14.7%	20.4%	12.0%	0.3%	8.4%	--	1	
Sherman		1,784	30,502	86.9%	0.5%	6.7%	5.9%	100.0%	12.1%	0.8%	9.3%	--	5	
Tillamook	** *	27,129	31,501	83.3%	0.8%	5.3%	10.6%	60.7%	13.6%	0.3%	9.2%	1	5	
Umatilla		79,509	27,140	64.0%	2.6%	5.6%	27.8%	31.7%	12.8%	0.3%	9.5%	--	2	
Union		26,255	28,596	88.0%	0.8%	6.1%	5.1%	42.9%	14.2%	1.4%	7.6%	--	2	
Wallowa		7,330	35,367	91.4%	0.6%	4.3%	3.7%	100.0%	9.0%	0.3%	3.6%	--	5	
Wasco	*	26,603	33,982	73.2%	2.4%	5.0%	19.4%	34.8%	9.7%	0.3%	5.4%	--	5	
Washington		596,969	44,362	63.7%	0.3%	18.9%	17.1%	5.5%	8.0%	0.6%	5.2%	--	1	
Wheeler		1,477	24,298	82.3%	0.1%	7.7%	9.9%	100.0%	14.0%	0.8%	7.7%	--	5	
Yamhill		107,024	34,765	75.8%	0.8%	7.1%	16.3%	26.5%	11.5%	0.6%	8.0%	--	1	
State		4,207,177	37,816	74.1%	0.8%	11.6%	13.6%	19.5%	12.1%	0.5%	7.5%		2	

- Notes: 1. State hatcheries show asterisks indicating the number of State hatcheries in the county.
2. Salmon commercial landings and recreational trips in Lane and Douglas counties are included in Coos County totals for index.
3. Columbia River Lower River commercial net fisheries are included in Clatsop County. Columbia River Upper River tribal fisheries are not included for index.
4. Recreational fishing expenditures for index are in 2008 dollars (thousands). Recreational fishing expenditures include saltwater and freshwater anadromous and resident fisheries.
5. Salmon commercial pounds index is ranking of landings at ports summed to be within counties. Clatsop had the highest landings and Tillamook had the lowest of all counties that had landings in Oregon.
6. Recreational fishing expenditures (travel and day trips) index are rankings (using five categories) of reported expenditures divided by county population. An index of 5 means the highest per capita expenditures and 1 means the lowest per capita expenditures.

Sources: 1. Census Bureau American Community Survey (ACS) 5-Year Estimates [31].
2. Rural population from The Ford Family Foundation and OSU Extension Service (August 2023) [32].

Appendix B
Hatchery Program Characterizations

Table B.1
Hatchery Rearing, Transfer, Release, and Fisheries Characterizations

Hatchery	Species	Stock		Annualized Budgets		Target Releases				Life Hatchery		SAR				Release Size (fpp)	Facilities Transferred		
		Name	Number	Fish No.	Months	Local	Transfers			State Share	Hatchery Months	Cycle Months	Rearing Share	Ocean				Freshwater	
							State	Outside	Total					Comm.	Rec.				Total
Alsea	trout	Trout (eggs/fry)	72T	156,136	12	--			--	--	--	--	--	--	--	--	--		
		Trout (legals)		151,939	12	151,836		151,836	100%	22	22	100%	--	--	--	57.06%	3.0		
		Trout (trophy)		4,200	6	4,353		4,353	100%	34	34	100%	--	--	--	57.06%	0.5		
	StW	StW Siletz (smolt)	33F	50,000	13	50,000		50,000	100%	16	16	100%	--	--	--	3.14%	6.0		
		StW Siletz (smolt)					8,000	8,000	0%	3	5	60%	--	--	--	--	8,000 to STEP egg-to-fry releases		
		StW Siuslaw (smolt)	38F	85,000	5	0	85,000	85,000	100%	16	16	100%	--	--	--	1.40%	6.0		
		StW Alsea (trap/spawn/smc 43H, 43F)		140,000	20	140,000		140,000	100%	16	16	100%	--	--	--	1.64%	6.0		
		StW Alsea (trap/spawn/smolt)						3,000	3,000	0%	3	5	60%	--	--	--	3,000 to STEP egg-to-fry releases		
Bandon	trout	Trout (trophy)	72T	3,200	8	3,000		3,000	100%	12	34	35%	--	--	--	38.96%	0.5 from Klamath 1 fpp, released trophy size local		
	StW	StW Coos	37H	125,000	2	0		125,000	0%	2	16	13%	--	--	--	1.47%	6.0 to outside hatcheries		
		StW Coquille	44H	45,000	16	45,000		45,000	100%	14	16	90%	--	--	--	2.34%	6.0		
		StW (Tenmile-eggs)	88H	30,000	3	0	25,000	25,000	100%	2	2	100%	--	--	--	1.17%	6.0 to Elk River		
		StW (SF Coquille)	144	70,000	15	70,000		70,000	100%	14	16	90%	--	--	--	2.34%	6.0		
	ChF	ChF Coos, eggs	37H	2,092,500	6		1,887,500	1,887,500	0%	2	8	25%	0.01%	0.00%	0.01%	0.11%	75.0 eggs to STEP and outside hatcheries		
		ChF Coos, pre-smolts				205,000		205,000	100%	8	8	100%	0.01%	0.00%	0.01%	0.11%	75.0		
		ChF Coquille-eggs	44H	145,000	10	0		175,000	175,000	0%	10	11	90%	0.06%	0.01%	0.07%	0.34%	13.0 to outside hatcheries	
Cedar Creek	StW	StW (Nestucca)	47F	140,000	17	140,000		140,000	100%	16	16	100%	--	--	--	1.75%	6.0		
	StS	StS (Nestucca)	47H	100,000	17	100,000		100,000	100%	17	18	94%	--	--	--	1.05%	6.0 remainder to outside		
		StS (Siletz-eggs)	33H	50,000	3	0	50,000	50,000	100%	2	2	100%	--	--	--	0.95%	6.0 to Salmon River		
	ChF	ChF Nestucca	47H	100,000	8	0		100,000	100%	11	11	100%	0.00%	0.00%	0.00%	1.11%	18.0 to STEP		
	ChS	ChS Trask	34H	215,000	9	210,000		210,000	100%	20	20	100%	0.07%	0.01%	0.07%	0.82%	10.0 eyed eggs from Trask		
		ChS Nestucca	47H	230,000	11	230,000		230,000	100%	20	20	100%	0.07%	0.01%	0.07%	0.82%	10.0		
Clackamas	ChS	ChS Clackamas, eggs	19H	1,050,000	12			1,230,000	1,230,000	0%	2	8	25%	--	--	--	--	1.3 million green eggs transferred out; 1.0 million transferred back for final rearing, with 70,000 released as fingerlings	
		ChS Clackamas, smolts				1,000,000		1,000,000	100%	8	13	62%	0.02%	0.00%	0.02%	0.13%	12.0		
	Coho	Coho Big Creek	13H	2,430,000	17	0		2,430,000	2,430,000	0%	16	18	90%	0.00%	0.04%	0.04%	0.91%	15.0 unfed fry from Cascade, to outside hatcheries	
	StS	StS (So. Santiam)	24H	150,000	2	150,000		150,000	100%	2	18	11%	--	--	--	1.19%	6.0 smolts from Bonneville released local		
	StW	StW Clackamas	122H	160,000	9	210,000		50,000	260,000	81%	9	16	56%	--	--	--	1.20%	6.0 eyed eggs to Oak Springs, some smolts back for local release	
Elk River	ChF	ChF-Elk River	35H	275,000	18	275,000		275,000	100%	11	11	100%	0.08%	0.09%	0.18%	0.28%	18.0		
	(trout)	ChF-Elk River/Garrison		250,000	5	250,000		250,000	100%	11	11	100%	--	--	--	0.10%	900.0 released fry closed system		
	ChF	ChF-Chetco	96H	200,000	12	200,000		200,000	100%	10	11	90%	0.05%	0.05%	0.10%	0.13%	18.0		
		ChF-Chetco					200	200	0%	3	5	60%	--	--	--	--	200 to STEP egg-to-fry releases		
		ChF-Umpqua/Smith	151H	70,000	12	70,000		70,000	100%	10	11	90%	0.07%	0.08%	0.15%	0.23%	18.0		
		ChF-Coquille	44H	50,000	10	50,000		50,000	100%	10	11	91%	0.07%	0.08%	0.15%	0.23%	18.0		
	StW	StW-Tenmile	88H	25,000	13	25,000		25,000	100%	13	16	81%	--	--	--	1.66%	6.0		
		StW-Chetco	96H	50,000	17	50,000		50,000	100%	16	16	100%	--	--	--	1.66%	6.0		
		StW-Chetco					1,400	1,400	0%	3	5	60%	--	--	--	--	1,400 to STEP egg-to-fry releases		
	trout	Trout	72T or 053T	9,000	9	13,267		13,267	100%	12	22	55%	--	--	--	66.67%	3.0 fingerlings from Klamath released as legals/trophy		
Klamath	trout	Brown Trout-CAT	71T	46,000	18	58,500		58,500	100%	22	22	100%	--	--	--	33.71%	3.0 eyed eggs from Shasta Hatchery		
		Rainbow Trout	53H	482,000	8	482,050		482,050	100%	8	22	36%	--	--	--	33.71%	3.0 fingerlings from Oak Springs		
		Rainbow Trout	53T	46,000	4	46,000		46,000	100%	4	22	18%	--	--	--	33.71%	3.0 fingerlings from Wizard Falls		
		Rainbow Trout fingerlings	72T	201,020	12	55,000	0	55,000	100%	10	10	100%	--	--	--	16.00%	50.0 eyed eggs from Roaring River, to Rock Creek, Bandon, Fall River, Elk River		
		Rainbow Trout legals		92,720	12	48,120	52,600	100,720	100%	12	22	55%	--	--	--	33.71%	3.0		
		Rainbow Trout legals				0	3,000	3,000	100%	22	34	65%	--	--	--	33.71%	3.0 transfer to Bandon as legal		
		Rainbow Trout trophy		13,350	10	14,400	14,500	28,900	100%	10	34	29%	--	--	--	33.71%	0.5		
		Rainbow mt. lakes	127T	25,000	6	25,000		25,000	100%	6	10	60%	--	--	--	5.00%	200.0 fry from Wizard Falls		
		Brook Trout	74T	32,000	6	32,000		32,000	100%	6	10	60%	--	--	--	5.00%	200.0 fry from Fall River		
Nehalem	ChF	ChF-Trask (Necanicum)	34H	25,000	4	25,000		25,000	100%	4	11	36%	0.01%	0.01%	0.01%	0.20%	18.0 smolts from Trask		
	Coho	Coho-NF Nehalem	32F	100,000	17	100,000		100,000	100%	17	18	94%	0.01%	0.09%	0.10%	0.74%	15.0		
		Coho-Trask	34F	100,000	12	0	100,000	100,000	100%	12	18	67%	0.03%	0.20%	0.23%	0.51%	15.0 smolts from Trask, to Trask		
	trout	Rainbow fingerlings	72T	73,100	12	5,000	500	5,500	91%	7	10	70%	--	--	--	5.00%	200.0 eyed eggs from Roaring River, some to STEP		
		Rainbow legals		68,100	12	66,550		66,550	100%	22	22	100%	--	--	--	45.04%	3.0		
		Rainbow trophy		1,550	9	1,550		1,550	100%	9	34	26%	--	--	--	45.04%	0.5		
	StW	StW-NF Nehalem	32F	105,000	17	90,000		90,000	100%	16	16	100%	--	--	--	1.85%	6.0		
		StW Necanicum	32H	25,000	17	40,000		40,000	100%	16	16	100%	--	--	--	1.08%	6.0		

Table B.1 (cont.)

Hatchery	Species	Stock		Annualized		Target Releases			Life Hatchery				SAR				Release	Facilities Transferred	
				Budgets		Local	Transfers		State Share	Hatchery Months	Cycle Months	Rearing Share	Ocean			Freshwater			
		Name	Number	Fish No.	Months		State	Outside					Total	Comm.	Rec.		Total	Size (fpp)	
Oak Springs	trout	Rainbow - eggs	53H	2,200,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		Eggs transferred outside					37,200	37,200	0%	3	22	14%	--	--	--	45.87%	3.0	reared and released legal by High Desert STEP and Lower Willamette STEP	
		Fingerlings transferred state		917,625	12		480,000	480,000	100%	10	22	45%	--	--	--	16.00%	21.5	transferred to Klamath for their release legal	
		Fingerlings released local		165,225	12	284,500		284,500	100%	10	10	100%	--	--	--	16.00%	21.5		
		Legals released local				140,800		140,800	100%	22	22	100%	--	--	--	45.04%	2.0		
		Trophy released local		43,825	8	13,105		13,105	100%	34	34	100%	--	--	--	45.04%	0.5		
		Rainbow - eggs	53T	2,500,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		Eggs transferred																	
		Released as fingerlings state					550,000	550,000	100%	3	22	14%	--	--	--	16.00%	200.0	transferred to Wizard/Fall Creek released legal	
		Released as fingerlings outside					13,000	13,000	0%	3	22	14%	--	--	--	16.00%	200.0	transferred to High Desert STEP released legal	
		Fingerlings																	
		Released as legals outside					234,000	234,000	0%	10	34	29%	--	--	--	45.04%	3.0	transferred to Irrigon and Willowa released legal/trophies	
		Sub-legals																	
		Released as legals state					8,000	8,000	100%	20	22	91%	--	--	--	45.04%	3.0	transferred to Rock Creek released legal	
		Released as legals outside					100,000	100,000	0%	20	22	91%	--	--	--	45.04%	3.0	transferred to Leaburg released legal	
		Legals																	
		Released local				22,000		22,000	100%	22	22	100%	--	--	--	45.04%	3.0		
		Trophy																	
		Released outside		5,000	7	5,000		5,000	100%	34	34	100%	--	--	--	45.04%	0.5	transferred to Bonneville released legal	
StS	StS - eyed eggs	66H					11,000	11,000	100%	--	--	--	--	--	--	--	--	--	transferred to Round Butte Hatchery released legal
(trout)	Released as smolt local, no migration		9,000	13	9,000			9,000	100%	18	18	100%	--	--	--	45.04%	6.0	released fry closed system, therefore trout SAR	
StW	StW - eyed eggs	122H	265,000	11	--	265,000	--	265,000	100%	--	--	--	--	--	--	--	--	--	-- from Clackamas
		Transferred as fingerlings																	
		Released as fingerlings state					100,000	100,000	100%	5	11	45%	--	--	--	1.20%	200.0		
		Released as smolts state					60,000	60,000	100%	11	11	100%	--	--	--	1.20%	6.0		
		Released as smolts outside					105,000	105,000	0%	5	11	45%	--	--	--	1.20%	6.0		
trout	WV Rainbow legals	133 (H&T)	20,300	36	18,300			18,300	100%	34	34	100%	--	--	--	45.04%	3.0	remainder brood stock	
Roaring River	trout	Rainbow - eggs	72T	1,000,000	36	0	--	--	--	--	--	--	--	--	--	--	--	--	-- to Alsea, Klamath, Salmon River, Nehalem, STEP, research, outside hatchc
		Rainbow - eggs		6,000,000	36	0	--	--	--	--	--	--	--	--	--	--	--	--	--
		Eggs transferred																	
		Released as legals state					890,000	890,000	100%	3	22	14%	--	--	--	57.06%	3.0	transferred to Alsea, Klamath, Nehalem released legal	
		Released as legals outside					1,419,000	1,419,000	0%	3	22	14%	--	--	--	57.06%	3.0	transferred to STEP (High Desert, Mid/Lwr -Willamette, Gardiner) and hatcheries (Cole Rivers, Willamette) released legal	
		Fingerlings																	
		Released local		422,581	12	255,400		255,400	100%	10	10	100%	--	--	--	16.00%	50.0	natural production legal	
		Released as legals state					43,000	43,000	100%	10	22	45%	--	--	--	57.06%	3.0	Salmon River released legal and trophy	
		Legals																	
		Released local		167,181	12	119,548		119,548	100%	22	22	100%	--	--	--	57.06%	3.0		
		Transferred state					600	600	100%	22	22	100%	--	--	--	57.06%	3.0	Cedar Creek released legal	
		Trophy		46,033	8	46,033		46,033	100%	34	34	100%	--	--	--	57.06%	0.5		
StS	Smolts	24H	96,000	14	96,000			96,000	100%	15	18	83%	--	--	--	0.86%	6.0	received eyed eggs from South Santiam	
StW	Smolts	38H	85,000	15	85,000			85,000	100%	15	18	83%	--	--	--	1.40%	6.0	received eyed eggs from Alsea Hatchery	
Salmon River	ChF	ChF (trap-release)	36H	200,000	13	200,000		200,000	100%	11	11	100%	0.03%	0.00%	0.04%	0.91%	18.0		
	Coho	Coho Big Creek (Klaskanine)	13H	385,000	11	0	385,000	385,000	0%	11	18	61%	0.00%	0.04%	0.04%	0.91%	15.0	to Klaskanine	
	trout	Rainbow	72T	30,000	12	30,000		30,000	100%	12	22	55%	--	--	--	45.04%	3.0	from Roaring River @ 75 fpp	
		Rainbow		15,700	12	4,500		4,500	100%	22	34	65%	--	--	--	45.04%	3.0	from Roaring River 75 fpp, released trophy local	
	StS	StS Siletz	33H	50,000	10	50,000		50,000	100%	10	18	56%	--	--	--	0.95%	6.0		
Trask	ChF	ChF (trap-release) smolts	34H	175,000	11	150,000	25,000	175,000	100%	11	11	100%	0.03%	0.00%	0.04%	1.72%	18.0	to Nehalem	
		unfed fry					1,700	1,700	0%	3	5	60%	--	--	--	--	--	to STEP egg-to-fry releases	
	ChS	ChS eggs	34H	340,000	14		205,000	395,000	52%	3	20	15%	--	--	--	--	--	to Cedar Creek+outside, back to Trask; 395,000 are transferred as green egg	
		ChS smolts				70,000		70,000	100%	13	13	100%	0.02%	0.00%	0.02%	0.44%	12.0		
		ChS smolts out and back				285,000		285,000	100%	8	20	40%	0.02%	0.00%	0.02%	0.44%	10.0		
		ChS smolts unfed fry					65,000	100,000	65%	2	20	10%	0.02%	0.00%	0.02%	0.44%	10.0	Cedar Cr (65,000) plus Whiskey Cr (35,000)	
		unfed fry					1,000	1,000	0%	3	5	60%	--	--	--	--	--	to STEP egg-to-fry releases	
	Coho	Coho (trap-release)	34W	100,000	8	100,000		100,000	100%	14	18	78%	0.01%	0.22%	0.23%	0.51%	15.0	to Nehalem then back to Trask	
		Coho (trap-release)					16,000	16,000	0%	3	18	17%	0.01%	0.22%	0.23%	0.51%	15.0	to STEP released as fingerlings in a reservoir, but fall over dam to ocean	
	StW	StW-Wilson	121W	157,000	16	110,000		110,000	100%	16	16	100%	--	--	--	2.67%	6.0	to Tuffy Creek	
		StW-Wilson unfed fry					40,000	40,000	0%	8	16	50%	--	--	--	2.67%	6.0		
		unfed fry					500	500	0%	3	5	60%	--	--	--	--	--	to STEP egg-to-fry releases	

Table B.1 (cont.)

Hatchery	Species	Stock Name	Number	Annualized Budgets		Target Releases			State Share	Hatchery Months	Life Cycle Months	Hatchery Rearing Share	SAR			Release Size (fpp)	Facilities Transferred	
				Fish No.	Months	Local	Transfers						Total	Ocean				
							State	Outside						Comm.	Rec.			Total
Wizard/Falls River (75:25)																		
trout	Rainbow -eggs	127H	350,000	36	0	--	--	--	--	--	--	--	--	--	--	--	--	to Fall River, Klamath, and other
	Rainbow -eggs	127T	1,200,000	36	0		197,600	197,600	0%	3	22	14%	--	--	--	45.04%	3.0	
	Rainbow fingerling	127H	50,000	12	48,925			48,925	100%	10	10	100%	--	--	--	16.00%	15.0	
	Rainbow trophy	127H	1,075	6	1,075			1,075	100%	34	34	100%	--	--	--	45.04%	0.4	
	Rainbow fingerling (odd year)	127T	284,000	12	99,200	133,000	9,600	241,800	96%	10	10	100%	--	--	--	2.50%	200.0	to Klamath and outside
	Rainbow fingerling	127T			241,800			241,800	100%	10	10	100%	--	--	--	16.00%	155.0	
	Rainbow legals	127T	18,125	8	51,525	46,000		97,525	100%	22	22	100%	--	--	--	45.04%	3.0	
	Rainbow trophy	127T			8,380			8,380	100%	34	34	100%	--	--	--	45.04%	1.0	
	Brook Trout -air fingerlings	74T	37,400	6	202,750	80,000	4,200	286,950	99%	7	10	70%	--	--	--	2.50%	200.0	eyed eggs from outside
	Rainbow Trout Legals	72T			41,196		450	41,646	99%	22	22	100%	--	--	--	45.04%	3.0	
	Brook Trout YY fingerlings	129H	35,000	9	35,000			35,000	100%	7	10	70%	--	--	--	1.00%	55.0	eyed eggs from outside
	Kokanee fingerlings	67H	170,000	12	200,000		25,000	225,000	89%	10	10	100%	--	--	--	16.00%	46.0	
	Rainbow fingerlings	53T	431,125	8	356,125		75,000	431,125	83%	7	10	70%	--	--	--	10.00%	80.0	eyed eggs from Oak Springs, transfers to Klamath
StS	StS	66H	100,000	16	100,000			100,000	100%	16	18	89%	--	--	--	--	6.0	reintroduction species, unknown SAR
trout	Tiger Trout	74T	40,000	12	40,000			40,000	100%	12	22	55%	--	--	--	0.00%	20.0	Tiger trout cannot be harvested in the two lakes where they are stocked
Rock Creek																		
ChS	ChS (trap-release)	55H	342,000	10	342,000			342,000	100%	20	20	100%	0.11%	0.01%	0.12%	0.24%	10.0	
Coho	Coho	18H	60,000	10	60,000			60,000	100%	18	18	100%	0.03%	0.60%	0.63%	1.84%	15.0	
trout	Rainbow legals	72T	76,000	8	55,100			55,100	100%	12	22	55%	--	--	--	45.04%	3.0	from Klamath as fingerlings, released legal local
	Rainbow trophy	53T			8,000			8,000	100%	12	34	35%	--	--	--	45.04%	0.5	from Oak Springs as legals, released trophy local
StS	StS Umpqua	55H	75,000	10	74,000			74,000	100%	10	18	56%	--	--	--	0.84%	6.0	
	StS Umpqua						1,000	1,000	0%	3	5	60%	--	--	--	--		1,000 STEP egg-to-fry release
StW	StW 18		150,000	10	150,000			150,000	100%	16	16	100%	--	--	--	2.36%	6.0	

- Notes:
1. Smolt to fisheries catch rates (SARs) are catch in Oregon commercial and recreational fisheries. Columbia River releases for ocean commercial catch include troll fishery landings at Oregon ports. Columbia River freshwater includes commercial gillnet fisheries with landings in Oregon and recreational catch from trips originating at Oregon side of Columbia River.
 2. Chinook average SARs based on CWT recoveries for brood years 2010-2017 and freshwater catch 2014-2021. Coho average SARs based on CWT recoveries for brood years 2000-2006 and freshwater catch 2013-2023. Steelhead average SARs based on harvest card (2013-2018) or ODFW Electronic Licensing System (2018-2022) expansions.
 3. StS 66H stock at Oak Springs and Fall River is a reintroduction species. The Oak Springs releases are in a closed system so the assigned SAR are if they are trout. The Fall River releases have an unknown SAR.
 4. ChF 35H stock at Elk River over production is release into Garrison Lake. It is a closed system with no migration so a trout SAR is assigned.
 5. The columns "annualized budgets" are assumptions from ODFW used to determine prorated costs by species programs. Annualized budget fish numbers are adjusted to be release equivalent. This means natural mortality between life cycle stages is incorporated into the fish numbers.
 6. The column "hatchery rearing share" is used to credit economic value to an individual hatchery based on rearing months spent at that hatchery compared to total rearing and acclimation months at time of release.
 7. Transfers to STEP egg-to-fry releases have insignificant SARs therefore no contribution to fisheries benefits are assumed.
 8. For Clackamas and Salmon River coho, the percent of SAR that is Oregon is estimated to be 2.85% ocean sport, 59.86% freshwater commercial, and 7.13% freshwater sport. For Clackamas spring Chinook, 0.99% ocean sport, 3.85% ocean commercial, 2.11% freshwater commercial, and 25.45% freshwater sport.

Source: Annualized budget information and SARs from ODFW personal communication. Hatchery operation characteristics from individual ODFW HPMP and hatchery manager interviews.

Table B.2a
Hatchery Production Regional Economic Impact Effects

Hatchery	REI Factors	Local REI Effects						Statewide REI Effects					Total	Bond	Wildfire	Capital	Total		
		PS	Utilities	Travel	Other	Support	Subtotal	Feed	Hdqr Admin	Field Mgmt	Mtnrc Heavy	Subtotal							
Alsea	Operating Share	66.2%	1.2%	0.8%	12.1%			19.6%											
	Amount	686,282	454,213	8,560	5,788	83,224	44,252	596,037	134,496	16,071	17,495	75,601	243,663	839,701	23,810	-	433,929	1,297,439	
	Statewide REI		670,373	2,802	3,077	60,662	39,721	776,635	47,666	8,298	9,033	55,105	120,101	896,736					
	Local REI		566,540	2,096	2,115	50,309	30,685	651,745						651,745					
Bandon	Operating Share	83.3%	1.5%	1.1%	7.7%			6.3%											
	Amount	401,181	334,335	6,096	4,384	30,967	163,989	539,771	25,399	16,071	17,495	74,197	133,162	672,932	23,810	-	143,036	839,778	
	Statewide REI		493,445	1,995	2,331	22,572	147,197	667,539	9,001	8,298	9,033	54,082	80,414	747,953					
	Local REI		417,016	1,493	1,602	18,719	113,710	552,540						552,540					
Cedar Creek	Operating Share	74.6%	2.1%	1.4%	10.5%			11.5%											
	Amount	583,938	435,397	12,157	8,008	61,446	77,683	594,692	66,928	16,071	17,495	74,488	174,982	769,675	23,810	-	300,429	1,093,913	
	Statewide REI		642,603	3,979	4,258	44,788	69,728	765,357	23,719	8,298	9,033	54,294	95,344	860,700					
	Local REI		543,071	2,977	2,927	37,144	53,865	639,985						639,985					
Clackamas	Operating Share	42.0%	16.3%	0.7%	28.0%			13.1%											
	Amount	898,878	377,100	146,333	6,263	251,686	269,356	1,050,737	117,689	45,476	9,095	77,793	250,053	1,300,790	130,476	-	344,464	1,775,730	
	Statewide REI		556,562	47,895	3,330	183,454	241,773	1,033,014	41,709	23,479	4,696	56,703	126,587	1,159,601					
	Local REI		470,357	35,837	2,289	152,144	186,771	847,398						847,398					
Elk River	Operating Share	66.9%	13.2%	1.3%	9.0%			9.7%											
	Amount	548,716	366,958	72,161	6,999	49,525	108,445	604,088	53,072	16,071	17,495	72,644	159,282	763,370	23,810	-	235,929	1,023,109	
	Statewide REI		541,594	23,618	3,721	36,099	97,340	702,372	18,809	8,298	9,033	52,950	89,089	791,462					
	Local REI		457,707	17,672	2,558	29,938	75,196	583,071						583,071					
Klamath	Operating Share	71.6%	0.6%	3.2%	8.6%			16.0%											
	Amount	528,251	378,360	3,085	16,818	45,430	47,337	491,030	84,705	16,071	17,495	72,490	190,761	681,790	23,810	260,000	188,571	1,154,171	
	Statewide REI		558,422	1,010	8,942	33,114	42,490	643,977	30,019	8,298	9,033	52,838	100,187	744,164					
	Local REI		471,928	756	6,147	27,462	32,823	539,117						539,117					
Nehalem	Operating Share	76.7%	7.8%	1.4%	1.6%			12.5%											
	Amount	533,682	409,149	41,773	7,561	8,647	53,664	520,795	66,551	16,071	17,495	76,497	176,614	697,409	23,810	-	249,964	971,183	
	Statewide REI		603,863	13,672	4,020	6,303	48,169	676,028	23,586	8,298	9,033	55,758	96,674	772,702					
	Local REI		510,332	10,230	2,764	5,227	37,211	565,763						565,763					
Oak Springs	Operating Share	66.8%	1.0%	2.5%	6.6%			23.1%											
	Amount	844,314	563,903	8,108	20,916	55,725	59,441	708,093	195,447	16,071	17,495	75,512	304,525	1,012,618	23,810	-	428,571	1,464,999	
	Statewide REI		832,264	2,654	11,121	40,618	53,355	940,012	69,266	8,298	9,033	55,040	141,637	1,081,649					
	Local REI		703,356	1,986	7,645	33,686	41,217	787,889						787,889					
Roaring Rive	Operating Share	57.1%	1.0%	2.6%	16.6%			22.6%											
	Amount	798,137	455,815	8,108	20,916	132,491	49,393	666,723	180,705	16,071	17,495	77,285	291,556	958,278	23,810	-	318,857	1,300,945	
	Statewide REI		672,737	2,654	11,121	96,573	44,335	827,420	64,042	8,298	9,033	56,333	137,705	965,124					
	Local REI		568,538	1,986	7,645	80,091	34,249	692,508						692,508					
Salmon Rive	Operating Share	65.2%	6.7%	2.1%	14.8%			11.2%											
	Amount	605,850	394,931	40,866	12,634	89,495	91,052	628,978	67,924	16,071	17,495	74,596	176,086	805,064	23,810	-	225,750	1,054,623	
	Statewide REI		582,879	13,375	6,718	65,233	81,728	749,933	24,072	8,298	9,033	54,373	95,775	845,708					
	Local REI		492,598	10,008	4,618	54,100	63,135	624,459						624,459					

Table B.2a (cont.)

Hatchery	REI Factors	Local REI Effects						Statewide REI Effects					Total	Bond	Wildfire	Capital	Total		
		PS	Utilities	Travel	Other	Support	Subtotal	Feed	Hdqr Admin	Field Mgmt	Mtnc Heavy	Subtotal							
Trask	Operating Share	75.8%	4.7%	2.2%	7.3%			10.0%											
	Amount	473,858	358,952	22,238	10,387	34,801	77,214	503,592	47,480	16,071	17,495	77,132	158,178	661,770	23,810	-	188,250	873,829	
	Statewide REI		529,777	7,279	5,523	25,366	69,307	637,252	16,827	8,298	9,033	56,221	90,378	727,630					
	Local REI		447,721	5,446	3,796	21,037	53,540	531,540						531,540					
Wizard/Falls	Operating Share	72.7%	3.1%	5.2%	6.7%			12.3%											
	Amount	765,391	556,369	23,726	40,105	51,281	30,630	702,111	93,776	32,143	17,495	152,294	295,708	997,819	47,619	-	347,143	1,392,581	
	Statewide REI		821,145	7,766	21,324	37,379	27,493	915,107	33,234	16,595	9,033	111,007	169,869	1,084,976					
	Local REI		693,959	5,810	14,658	30,999	21,239	766,666						766,666					
Rock Creek	Operating Share	27.8%	3.7%	2.1%	52.5%			13.9%											
	Amount	531,181	147,661	19,846	10,905	278,932	75,364	532,708	73,837	16,071	17,495	67,857	175,260	707,968	23,810	900,000	475,500	2,107,277	
	Statewide REI		217,933	6,496	5,798	203,314	67,647	501,187	26,168	8,298	9,033	49,461	92,959	594,146					
	Local REI		184,177	4,860	3,986	168,614	52,257	413,895						413,895					
All	Operating Share	63.8%	5.0%	2.1%	14.3%			14.7%											
	Amount	8,199,658	5,233,144	413,058	171,684	1,173,650	1,147,820	8,139,355	1,208,010	254,405	219,031	1,048,383	2,729,829	10,869,184	440,000	1,160,000	3,880,393	16,349,577	
	Statewide REI		7,723,597	135,194	91,284	855,473	1,030,283	9,835,831	428,119	131,349	113,086	764,166	1,436,720	11,272,552					
	Local REI		6,527,300	101,158	62,750	709,471	795,898	8,196,578						8,196,578					

Notes: 1. Bond expenses, insurance payments, and capital contribution costs are not included in REI.

2. RIMS II response coefficient industry codes for hatchery expenditure items in local economy model are PS (115000), Utilities (221300), Travel (721000), Other (811300), Support (115000). Industry codes in statewide economy model are PS (115000), Utilities (221300), Travel (721000), Other (811300), Support (115000), Feed (311700), Hdqr Admin (S00A00), Field Mgmt (S00A00), Mtnc Heavy (811300).

3. Support includes fish health, marking, and liberation. Hdqr Admin is admin headquarters. Field Mgmt is admin field (excluding insurance). Mtnc Heavy is housing, emergency, and R&E.

Sources: Operating shares and amounts from ODFW. Economy response coefficients from RIMS II for data year 2021. Local response coefficient from five coastal counties model.

Table B.2b
Individual Hatchery Operations Local and Statewide Regional Economic Impact and Jobs

<u>Hatchery</u>	<u>County</u>	<u>Local REI</u>	<u>Local FTE Jobs</u>	<u>State REI</u>	<u>State FTE Jobs</u>
Alsea	Lincoln	651,745	14	896,736	18
Bandon	Coos	552,540	11	747,953	15
Cedar Creek	Tillamook	639,985	13	860,700	17
Clackamas	Clackamas	847,398	18	1,159,601	23
Elk River	Curry	583,071	12	791,462	16
Klamath	Klamath	539,117	11	744,164	15
Nehalem	Tillamook	565,763	12	772,702	15
Oak Springs	Wasco	787,889	16	1,081,649	21
Roaring River	Linn	692,508	14	965,124	19
Salmon River	Lincoln	624,459	13	845,708	17
Trask	Tillamook	531,540	11	727,630	14
Wizard/Falls River	Jefferson/Deschutes	766,666	16	1,084,976	22
Rock Creek	Douglas	<u>413,895</u>	<u>9</u>	<u>594,146</u>	<u>12</u>
Total		8,196,578	171	11,272,552	223

Notes: 1. Jobs are full and part-time equivalent (FTE). The calculation of FTE is assumed to be average annual earnings for Oregon statewide or coastwide economies.

Sources: Average income per job from BEA (January 2024).

Table B.3
Individual Hatchery Facility Depreciation and Annual Capital Contributions

Alsea Hatchery

Stock Production		ID	Capital Cost	Pounds of Fish Reared by Facility				Replacement Cost				
				2021	2022	2023	Average	Item	Year	Per Unit	Units	Amount
trout	Trout (eggs/fry)	72T		93,011	89,264	86,148	89,474	House		\$ 750,000	4	\$ 3,000,000
	Trout (legals)							Shop				\$ 200,000
	Trout (trophy)							Hatch house				\$ 3,500,000
StW	StW Siletz (smolt)	33F		34,985	33,210	26,464	31,553	Office				\$ -
	StW Siletz (smolt)							Intakes(s)		\$ 2,000,000	9.4	\$ 18,800,000
	StW Siuslaw (smolt)	38F						Pumps		\$ 50,000	-	\$ -
	StW Alsea (trap/spawn/smolt)	43H, 43F						Piping		\$ 400	5,200	\$ 2,080,000
	StW Alsea (trap/spawn/smolt)							Valves		\$ 10,000	57	\$ 570,000
	Total		\$ 40,500,000	127,996	122,474	112,612	121,027	Abatement				\$ 400,000
	Cost per facility pound		\$ 335					Discharge				\$ 200,000
								Raceways		\$ 250,000	33	\$ 8,250,000
								Adult holding and ladder		\$ 250,000	2	\$ 500,000
								Adult trap and ladder		\$ 3,000,000	1	\$ 3,000,000
								Year last 1936 major constructed				
								*Projected 2022		\$ 1,923,596		
								from major construction				
								Total (est 2022)				\$ 40,500,000

Comments: Cost includes upgrade structures

Table B.3 (cont.)

Bandon Hatchery

Stock Production		ID	Capital Cost	Pounds of Fish Reared by Facility				Replacement Cost				
				2021	2022	2023	Average	Item	Year	Per Unit	Units	Amount
trout	Trout (trophy)	72T		4,042	4,576	4,128	4,249	House		\$ 750,000	3	\$ 2,250,000
StW	StW Coos	37H		20,176	20,875	20,209	20,420	Shop				\$ 200,000
	StW Coquille	44H						Hatch house				\$ 3,500,000
	StW (Tenmile-eggs)	88H						Office				\$ -
	StW (SF Coquille)	144						Intakes(s)		\$ 2,000,000	1.2	\$ 2,400,000
ChF	ChF Coos, eggs	37H		7,024	5,342	9,801	7,389	Pumps		\$ 50,000	-	\$ -
	ChF Coos, pre-smolts							Piping		\$ 400	2,000	\$ 800,000
	ChF Coquille-eggs	44H						Valves		\$ 10,000	20	\$ 200,000
	Total		\$ 13,350,000	31,242	30,793	34,138	32,058	Abatement				\$ -
	Cost per facility pound		\$ 416					Discharge				\$ -
Non-operating expenses								Raceways		\$ 250,000	7	\$ 1,750,000
	Depreciation (existing assets fully depreciated)		\$ -					Adult holding and ladder		\$ 250,000	1	\$ 250,000
	Facility replacement estimate		\$ 13,350,000					Adult trap and ladder		\$ 2,000,000	1	\$ 2,000,000
	Salvage value (25 percent replacement estimate)		\$ 3,337,500					Year last 1925 major constructed				
	Useful life (years)		70					*Projected 2022		\$ 798,295		
	Annual capital contribution (straight-line)		\$ 143,036					from major construction				
	Interest expense		\$ -					Total (est 2022)				\$ 13,350,000

Comments: Cost includes upgrade structures

Table B.3 (cont.)

Cedar Creek Hatchery

Stock Production		ID	Capital Cost	Pounds of Fish Reared by Facility				Replacement Cost				
				2021	2022	2023	Average	Item	Year	Per Unit	Units	Amount
StW	StW (Nestucca)	47F		21,185	12,529	19,395	17,703	House		\$ 750,000	3	\$ 2,250,000
StS	StS (Nestucca)	47H		20,497	19,819	20,262	20,193	Shop				\$ 1,500,000
	StS (Siletz-eggs)	33H						Hatch house				\$ 3,500,000
ChF	ChF Nestucca	47H		401	412	407	407	Office				\$ 500,000
ChS	ChS Trask	34H		26,318	25,387	31,251	27,652	Intakes(s)		\$ 2,000,000	4.45	\$ 8,900,000
	ChS Nestucca	47H						Pumps		\$ 50,000	2	\$ 100,000
trout				1,942	1,919	1,309	1,723	Piping		\$ 400	4,000	\$ 1,600,000
Coho								Valves		\$ 10,000	34	\$ 340,000
	Total		\$ 28,040,000	70,343	60,066	72,624	67,678	Abatement				\$ 400,000
	Cost per facility pound		\$ 414					Discharge				\$ 200,000
Non-operating expenses								Raceways		\$ 250,000	21	\$ 5,250,000
	Depreciation (existing assets fully depreciated)		\$ -					Adult holding and ladder		\$ 250,000	2	\$ 500,000
	Facility replacement estimate		\$ 28,040,000					Adult trap and ladder		\$ 3,000,000	1	\$ 3,000,000
	Salvage value (25 percent replacement estimate)		\$ 7,010,000					Year last 1925 major constructed				
	Useful life (years)		70					*Projected 2022		\$ 1,640,840		
	Annual capital contribution (straight-line)		\$ 300,429					from major construction				
	Interest expense		\$ -					Total (est 2022)				\$ 28,040,000

Comments: Cost includes upgrade structures

Table B.3 (cont.)

Clackamas Hatchery

			Pounds of Fish Reared by Facility				Replacement Cost					
Stock Production		ID	Capital Cost	2021	2022	2023	Average	Item	Year	Per Unit	Units	Amount
ChS	ChS Clackamas, eggs	19H		2,681	28,758	-24,289	15,720	House		\$ 750,000	4	\$ 3,000,000
	ChS Clackamas, smolts							Shop				\$ 200,000
Coho	Coho Big Creek	13H		54,565	67,868	66,630	61,217	Hatch house				\$ 3,500,000
StS	StS (So. Santiam)	24H		1,654	-745	-934	455	Office				\$ -
StW	StW Clackamas	122H		-2,400	9,965	-2,896	3,783	Intakes(s)		\$ 2,000,000	8.00	\$ 16,000,000
trout				2,214			1,107	Pumps		\$ 50,000	5	\$ 250,000
	Total		\$ 32,150,000	58,714	105,846	38,511	82,280	Piping		\$ 400	4,000	\$ 1,600,000
	Cost per facility pound		\$ 391					Valves		\$ 10,000	20	\$ 200,000
								Abatement				\$ 400,000
								Discharge				\$ -
	Non-operating expenses							Raceways		\$ 250,000	13	\$ 3,250,000
	Depreciation (existing assets fully depreciated)		\$ -					Adult holding and ladder		\$ 250,000	3	\$ 750,000
	Facility replacement estimate		\$ 32,150,000					Adult trap and ladder		\$ 3,000,000	1	\$ 3,000,000
	Salvage value (25 percent replacement estimate)		\$ 8,037,500					Year last major constructed	1979			
	Useful life (years)		70					*Projected from major construction	2022	\$ 7,913,550		
	Annual capital contribution (straight-line)		\$ 344,464					Total (est 2022)				\$ 32,150,000
	Interest expense		\$ -									

Comment: Cost includes upgrade structures; doesn't include hydro install \$3 million

Table B.3 (cont.)

Elk River Hatchery

Stock Production		ID	Capital Cost	Pounds of Fish Reared by Facility				Replacement Cost				
				2021	2022	2023	Average	Item	Year	Per Unit	Units	Amount
ChF	ChF-Elk River	35H		38,767	38,386	30,779	35,977	House		\$ 750,000	3	\$ 2,250,000
(trout)	ChF-Elk River/Garrison							Shop				\$ 200,000
ChF	ChF-Chetco	96H						Hatch house				\$ 3,500,000
	ChF-Chetco							Office				\$ -
	ChF-Umpqua/Smith	151H						Intakes(s)		\$ 2,000,000	3.56	\$ 7,120,000
	ChF-Coquille	44H						Pumps		\$ 50,000	4	\$ 200,000
StW	StW-Tenmile	88H		8,170	1,123	5,468	4,920	Piping		\$ 400	3,000	\$ 1,200,000
	StW-Chetco	96H						Valves		\$ 10,000	30	\$ 300,000
	StW-Chetco							Abatement				\$ -
trout	Trout	72T or 053T		7,716	7,846	5,981	7,181	Discharge				\$ -
	Total		\$ 22,020,000	54,653	47,355	42,228	48,079	Raceways		\$ 250,000	24	\$ 6,000,000
	Cost per facility pound		\$ 458					Adult holding and ladder		\$ 250,000	1	\$ 250,000
Non-operating expenses								Adult trap and ladder		\$ 1,000,000	1	\$ 1,000,000
	Depreciation (existing assets fully depreciated)		\$ -					Year last 1968				
	Facility replacement estimate		\$ 22,020,000					major constructed				
	Salvage value (25 percent replacement estimate)		\$ 5,505,000					*Projected 2022		\$ 2,594,646		
	Useful life (years)		70					from major construction				
	Annual capital contribution (straight-line)		\$ 235,929					Total (est 2022)				\$ 22,020,000
	Interest expense		\$ -									

Comments: Cost includes upgrade structures

Table B.3 (cont.)

Klamath Hatchery

Stock Production		ID	Capital Cost	Pounds of Fish Reared by Facility				Replacement Cost				
				2021	2022	2023	Average	Item	Year	Per Unit	Units	Amount
trout	Brown Trout-CAT	71T			3,735	6,730	3,488	House		\$ 750,000	4	\$ 3,000,000
	Rainbow Trout	53H		124,354	89,467	100,028	104,616	Shop				\$ 7,000,000
	Rainbow Trout	53T						Hatch house				\$ -
	Rainbow Trout fingerlings	72T						Office				\$ -
	Rainbow Trout legals							Intakes(s)		\$ -		\$ 1,000,000
	Rainbow Trout legals							Pumps		\$ 50,000	-	\$ -
	Rainbow Trout trophy							Piping		\$ 400	3,000	\$ 1,200,000
	Rainbow mt. lakes	127T						Valves		\$ 10,000	30	\$ 300,000
	Brook Trout	74T		23		-1	7	Abatement				\$ -
ChS					830	1,106	645	Discharge				\$ 100,000
	Total		\$ 17,600,000	124,377	94,032	107,863	108,757	Raceways		\$ 250,000	20	\$ 5,000,000
	Cost per facility pound		\$ 162					Adult holding and ladder		\$ 250,000	-	\$ -
Non-operating expenses												
	Depreciation (existing assets fully depreciated)		\$ -					Adult trap and ladder		\$ -	1	\$ -
	Facility replacement estimate		\$ 17,600,000					Year last 1929				
	Salvage value (25 percent replacement estimate)		\$ 4,400,000					major constructed				
	Useful life (years)		70					*Projected 2022		\$ 1,028,378		
	Annual capital contribution (straight-line)		\$ 188,571					from major construction				
	Interest expense		\$ -					Total (est 2022)				\$ 17,600,000

Comments: Cost includes upgrade structures

Table B.3 (cont.)

Nehalem Hatchery

			Pounds of Fish Reared by Facility				Replacement Cost					
Stock Production		ID	Capital Cost	2021	2022	2023	Average	Item	Year	Per Unit	Units	Amount
ChF	ChF-Trask (Necanicum)	34H		1,184	1,118	1,113	1,138	House		\$ 750,000	4	\$ 3,000,000
Coho	Coho-NF Nehalem	32F		12,442	11,236	12,886	12,188	Shop				\$ 200,000
	Coho-Trask	34F						Hatch house				\$ 3,500,000
trout	Rainbow fingerlings	72T		42,904	40,664	33,227	38,932	Office				\$ -
	Rainbow legals							Intakes(s)		\$ 2,000,000	3.56	\$ 7,120,000
	Rainbow trophy							Pumps		\$ 50,000	4	\$ 200,000
StW	StW-NF Nehalem	32F		18,269	16,914	20,836	18,673	Piping		\$ 400	3,000	\$ 1,200,000
	StW Necanicum	32H						Valves		\$ 10,000	36	\$ 360,000
	Total		\$ 23,330,000	74,799	69,932	68,062	70,931	Abatement				\$ 400,000
	Cost per facility pound		\$ 329					Discharge				\$ 100,000
								Raceways		\$ 250,000	24	\$ 6,000,000
								Adult holding and ladder		\$ 250,000	1	\$ 250,000
								Adult trap and ladder		\$ 1,000,000	1	\$ 1,000,000
								Year last 1966 major constructed				
								*Projected 2022		\$ 2,560,735		
								from major construction				
								Total (est 2022)				\$ 23,330,000

Comments: Cost includes upgrade structures

Table B.3 (cont.)

Salmon River Hatchery

Stock Production		ID	Capital Cost	Pounds of Fish Reared by Facility				Replacement Cost				
				2021	2022	2023	Average	Item	Year	Per Unit	Units	Amount
ChF	ChF (trap-release)	36H		11,518	11,891	11,627	11,679	House		\$ 750,000	3	\$ 2,250,000
Coho	Coho Big Creek (Klaskanine)	13H		10,458	6,040	13,189	9,896	Shop				\$ 250,000
trout	Rainbow	72T		21,467	12,318	20,142	17,976	Hatch house				\$ 3,500,000
	Rainbow							Office				\$ -
StS	StS Siletz	33H						Intakes(s)		\$ 2,000,000	2.66	\$ 5,320,000
	Total		\$ 21,070,000	43,443	30,249	44,958	39,550	Pumps		\$ 50,000	4	\$ 200,000
	Cost per facility pound		\$ 533					Piping		\$ 400	2,500	\$ 1,000,000
								Valves		\$ 10,000	20	\$ 200,000
Non-operating expenses								Abatement				\$ 1,500,000
	Depreciation (existing assets fully depreciated)		\$ -					Discharge				\$ 100,000
	Facility replacement estimate		\$ 21,070,000					Raceways		\$ 250,000	13	\$ 3,250,000
	Salvage value (25 percent replacement estimate)		\$ 5,267,500					Adult holding and ladder		\$ 250,000	2	\$ 500,000
	Useful life (years)		70					Adult trap and ladder		\$ 3,000,000	1	\$ 3,000,000
	Annual capital contribution (straight-line)		\$ 225,750					Year last major constructed				
	Interest expense		\$ -					*Projected from major construction		2022	\$ 3,836,620	
								Total (est 2022)				\$ 21,070,000

Comment: Cost includes upgrade structures; doesn't include obmeyer weir \$18 million

Table B.3 (cont.)

Trask Hatchery

Stock Production		ID	Capital Cost	Pounds of Fish Reared by Facility				Replacement Cost				
				2021	2022	2023	Average	Item	Year	Per Unit	Units	Amount
ChF	ChF (trap-release) smolts unfed fry	34H		8,287	6,718	5,344	6,783	House		\$ 750,000	3	\$ 2,250,000
ChS	ChS eggs	34H		7,631	7,999	7,307	7,646	Shop				\$ 250,000
	ChS smolts							Hatch house				\$ 3,500,000
	ChS smolts out and back							Office				\$ -
	ChS smolts unfed fry							Intakes(s)		\$ 2,000,000	2.66	\$ 5,320,000
Coho	Coho (trap-release)	34W		845	590	480	638	Pumps		\$ 50,000	1	\$ 50,000
	Coho (trap-release)							Piping		\$ 400	3,500	\$ 1,400,000
StW	StW-Wilson	121W		12,213	9,820	8,428	10,154	Valves		\$ 10,000	20	\$ 200,000
	StW-Wilson unfed fry							Abatement				\$ 500,000
trout				2,043	1,449	1,750	1,747	Discharge				\$ 100,000
	Total		\$ 17,570,000	31,019	26,576	23,309	26,968	Raceways		\$ 250,000	10	\$ 2,500,000
	Cost per facility pound		\$ 652					Adult holding and ladder		\$ 250,000	2	\$ 500,000
Non-operating expenses								Adult trap and ladder		\$ 1,000,000	1	\$ 1,000,000
	Depreciation (existing assets fully depreciated)		\$ -					Year last 1916 major constructed				
	Facility replacement estimate		\$ 17,570,000					*Projected 2022		\$ 652,536		
	Salvage value (25 percent replacement estimate)		\$ 4,392,500					from major construction				
	Useful life (years)		70					Total (est 2022)				\$ 17,570,000
	Annual capital contribution (straight-line)		\$ 188,250									
	Interest expense		\$ -									

Comments: Cost includes upgrade structures

Table B.3 (cont.)

Rock Creek Hatchery

			Pounds of Fish Reared by Facility				Replacement Cost					
Stock Production		ID	Capital Cost	2021	2022	2023	Average	Item	Year	Per Unit	Units	Amount
ChS	ChS (trap-release)	55H		4,441	7,217	-10,249	470	House		\$ 750,000	5	\$ 3,750,000
Coho	Coho	18H						Shop				\$ 7,000,000
trout	Rainbow legals	72T		-4,125	11,716	24,776	10,789	Hatch house				\$ -
	Rainbow trophy	53T						Office				\$ -
StS	StS Umpqua	55H			2,578	-1,745	278	Intakes(s)		\$ 2,000,000	12.00	\$ 24,000,000
	StS Umpqua							Pumps		\$ 50,000	4	\$ 200,000
StW	StW 18						Piping		\$ 400	5,200	\$ 2,080,000	
ChF							Valves		\$ 10,000	25	\$ 250,000	
	Total		\$ 44,380,000	316	21,511	12,782	11,536	Abatement				\$ 1,500,000
	Cost per facility pound		\$ 518					Discharge				\$ 100,000
Non-operating expenses								Raceways		\$ 250,000	17	\$ 4,250,000
	Depreciation (existing assets fully depreciated)		\$ -					Adult holding and ladder		\$ 250,000	1	\$ 250,000
	Facility replacement estimate		\$ 44,380,000					Adult trap and ladder		\$ 1,000,000	1	\$ 1,000,000
	Salvage value (25 percent replacement estimate)		\$ 11,095,000					Year last major constructed		1979		
	Useful life (years)		70					*Projected from major construction		2022	\$ 10,959,895	
	Annual capital contribution (straight-line)		\$ 475,500					Total (est 2022)				\$ 44,380,000
	Interest expense		\$ -									

Comments: Cost includes upgrade structures

- Notes: 1. Cost per facility pound is based on hatchery total cost and three-year facility production average (except Clackamas Hatchery is two-year and Rock Creek is attributed pounds). Production pounds reported in ODFW (May 2024).
 2. Interest expense would be included as a non-operating expense if facility construction was funded by a loan.

Table B.4
Hatchery Engineering and Maintenance Projects in the Last 10 Years

Hatchery	Year	Project	Funding	Amount
Alsea	2018	Alsea Hatchery Valve Replacement		\$ 5,107
Bandon	2022	Bandon Hatchery Septic Replacement		\$ 25,000
	2023	Bandon Hatchery Septic Replacement		\$ 25,000
Cedar Creek	2015	Cedar Creek Storage Tank Removal		\$ 24,754
		Cedar Creek Residence lead Abatement		\$ 3,450
	2016	Cedar Creek Hatchery Pond Improvement	ODOT/R&E	\$ 1,680,630
		Cedar Creek Hatchery Pump Improvement	R&E	\$ 89,927
	2021	Cedar Creek Hatchery – Three Rivers Fish Trap Replacement	Bond	\$ 2,500,000
		Cedar Creek Hatchery – Sand Trap Building Roof Replacement	Bond	\$ 145,000
	2022	Cedar Creek Hatchery Office Roof Replacement	Bond	\$ 88,000
		Cedar Creek Shop Roof Replacement	Bond	\$ 101,032
	2023	Cedar Creek Hatchery Office Roof Replacement	Bond	\$ 88,000
		Cedar Creek Shop Roof Replacement	Bond	\$ 101,032
Clackamas				
Elk River	2017	Elk River VFD Pump Station Improvement		\$ 51,604
		Elk River Waterline Improvement	R&E	\$ 30,800
	2021	Elk River Hatchery – Domestic Pipeline Replacement	Bond	\$ 165,000
Klamath	2019	Klamath Hatchery Wall Repair	Bond	\$ 81,997
Nehalem	2014	Nehalem Lighting Upgrade		\$ 11,783
Oak Springs	2014	Oak Springs Pipeline Repair		\$ 2,450
	2015	Oak Springs Hatchery HVAC Replacement		\$ 1,700
	2018	Oak Springs Hatchery Alarm Repair		\$ 495
Roaring River	2018	Roaring River Hatchery Pond Replacement		\$ 931,195
	2020	Roaring River Paving	R&E	\$ 73,850
	2022	Roaring River Septic Repair	SFR	\$ 26,500
		Roaring River Roof Replacement		\$ 26,250
	2023	Roaring River Septic Repair	SFR	\$ 26,500
		Roaring River Roof Replacement		\$ 26,250
Rock Creek	2014	Rock Creek Jib Crane Install		\$ 8,573
		Rock Creek Valve Repair		\$ 13,481
	2015	Rock Creek Pond Replacement		\$ 588,674
		Rock Creek Residence Roof Replacement		\$ 52,237
	2017	Rock Creek Hatchery Raw Water Filter Improvement	R&E	\$ 75,699
	2018	Rock Creek Hatchery Pumping Station Repair		\$ 59,406
Salmon River	2015	Salmon River Waste Drain Repair		\$ 11,815
	2020	Salmon River VFD Pump Control Install	Bond	\$ 40,040
	2022	Salmon River Hatchery Pipeline Replacement	Bond	\$ 368,065
		Salmon River Electrical Protection System	Bond	\$ 18,250
		Salmon River Main Valve Replacement	Bond	\$ 198,449
		Salmon River Pump Replacement	Bond	\$ 307,260
		Salmon Hatchery Intake Replacement	Bond	\$ 895,539
		Salmon River Holding Pond Replacement	Bond	\$ 189,329
	2023	Salmon River Hatchery Pipeline Replacement	Bond	\$ 368,065
		Salmon River Electrical Protection System	Bond	\$ 18,250
		Salmon River Main Valve Replacement	Bond	\$ 198,449
		Salmon River Pump Replacement	Bond	\$ 307,260
		Salmon Hatchery Intake Replacement	Bond	\$ 895,539
		Salmon River Holding Pond Replacement	Bond	\$ 189,329
Trask				
Wizard/Falls River	2014	Wizard Falls New Electric Service		\$ 28,005
	2015	Wizard Falls Backup Generator - Phase 1		\$ 33,480
	2016	Wizard Falls Hatchery Pond Improvement	R&E	\$ 144,922
	2016	Wizard Falls Hatchery Electrical Improvement	R&E	\$ 94,000
	2019	Fall River Fishway & Intake Screen Improvement	Bond	\$ 256,621
			Total	\$ 11,694,043

Notes: 1. Funding program was not provided for all projects in the information source.

Source: ODFW propagation reports (various years) Table 27.

Table B.5
Individual Hatchery Budget Source and Use

Hatchery	Operations									Operations Breakdown					
	GF%	GF	OF%	OF	FF%	FF	Other%	Other	Total	PS	Feed	Utilities	Travel	Other	Total
Alea	0.0%	-	100.0%	686	0.0%	-	0.0%	-	686	66.2%	19.6%	1.2%	0.8%	12.1%	100.0%
Bandon	0.0%	-	100.0%	401	0.0%	-	0.0%	-	401	83.3%	6.3%	1.5%	1.1%	7.7%	100.0%
Cedar Creek	1.8%	11	98.2%	573	0.0%	-	0.0%	-	584	74.6%	11.5%	2.1%	1.4%	10.5%	100.0%
Clackamas	0.0%	-	0.0%	-	81.8%	735	18.2%	164	899	42.0%	13.1%	16.3%	0.7%	28.0%	100.0%
Elk River	76.6%	420	23.4%	128	0.0%	-	0.0%	-	549	66.9%	9.7%	13.2%	1.3%	9.0%	100.0%
Klamath	0.0%	-	25.0%	132	75.0%	396	0.0%	-	528	71.6%	16.0%	0.6%	3.2%	8.6%	100.0%
Nehalem	25.7%	137	74.3%	397	0.0%	-	0.0%	-	534	76.7%	12.5%	7.8%	1.4%	1.6%	100.0%
Oak Springs	0.0%	-	22.3%	188	74.4%	628	3.3%	28	844	66.8%	23.1%	1.0%	2.5%	6.6%	100.0%
Roaring River	0.0%	-	18.2%	145	81.8%	653	0.0%	-	798	57.1%	22.6%	1.0%	2.6%	16.6%	100.0%
Salmon River	42.0%	254	58.0%	351	0.0%	-	0.0%	-	606	65.2%	11.2%	6.7%	2.1%	14.8%	100.0%
Trask	88.1%	417	11.9%	56	0.0%	-	0.0%	-	474	75.8%	10.0%	4.7%	2.2%	7.3%	100.0%
Wizard/Falls River	0.0%	-	25.0%	191	75.0%	574	0.0%	-	765	72.7%	12.3%	3.1%	5.2%	6.7%	100.0%
Rock Creek	35.1%	186	59.1%	314	0.0%	-	5.8%	31	531	27.8%	13.9%	3.7%	2.1%	52.5%	100.0%
Total		1,426		3,564		2,987		222	8,200						

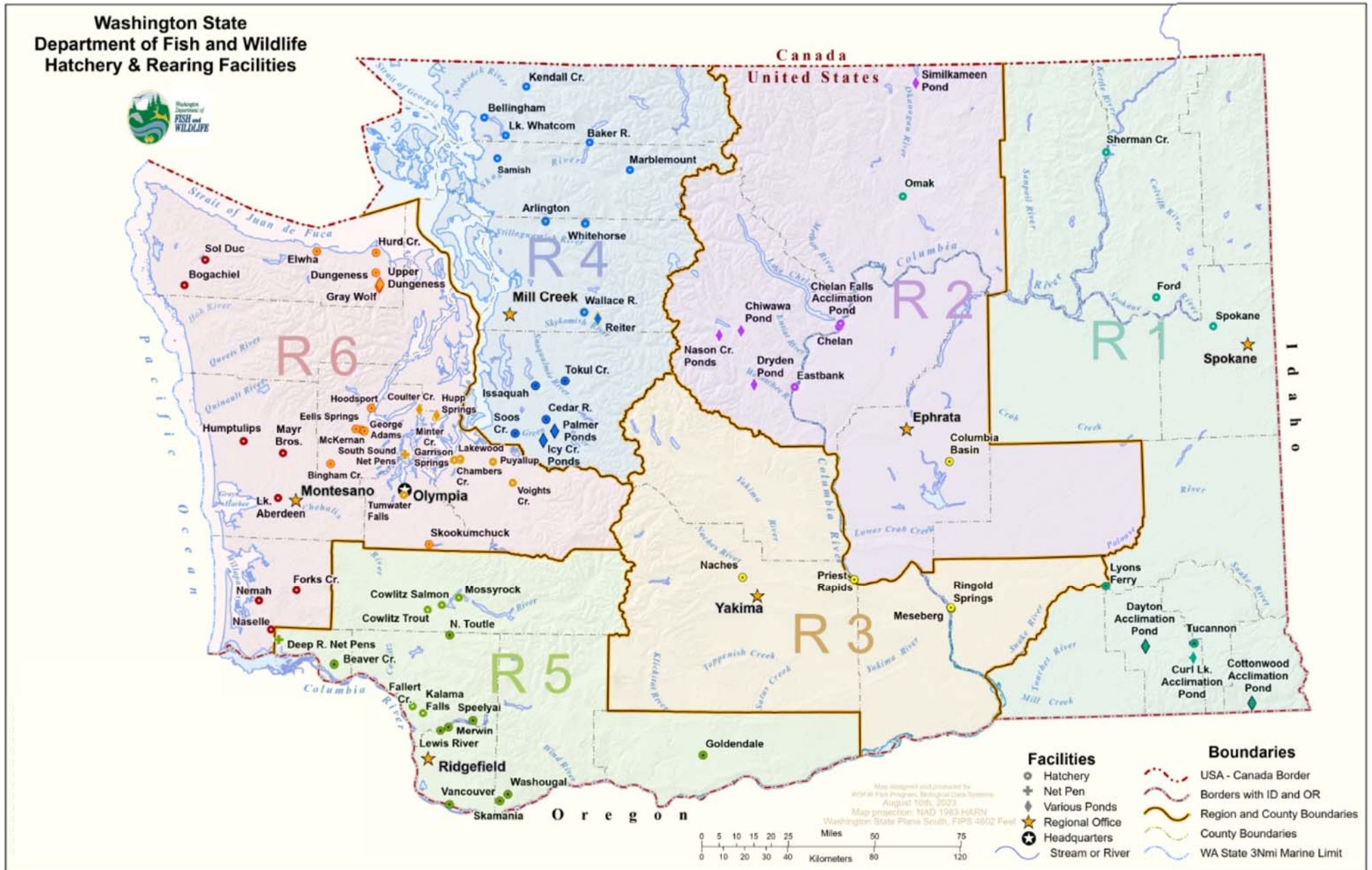
Hatchery	Support														
	Admin		Marking		Liberation					Health					
	100%	OF	100%	GF	GF%	GF	OF%	OF	FF%	FF	Total	GF%	GF	OF%	OF
Alea	34		14	62.5%	7	37.5%	4	0.0%	-	12	42.3%	8	57.7%	11	19
Bandon	34		133	62.5%	7	37.5%	4	0.0%	-	12	42.3%	8	57.7%	11	19
Cedar Creek	34		50	62.5%	7	37.5%	4	0.0%	-	12	42.3%	7	57.7%	9	16
Clackamas	55		208	0.0%	-	0.0%	-	100.0%	42	42	42.3%	8	57.7%	11	19
Elk River	34		75	62.5%	7	37.5%	4	0.0%	-	12	42.3%	9	57.7%	12	21
Klamath	34		-	0.0%	-	22.0%	9	78.0%	32	40	42.3%	3	57.7%	4	7
Nehalem	34		23	62.5%	7	37.5%	4	0.0%	-	12	42.3%	8	57.7%	11	19
Oak Springs	34		19	0.0%	-	22.0%	7	78.0%	26	33	42.3%	3	57.7%	4	7
Roaring River	34		9	0.0%	-	22.0%	7	78.0%	26	33	42.3%	3	57.7%	4	7
Salmon River	34		67	62.5%	3	37.5%	2	0.0%	-	5	42.3%	8	57.7%	11	19
Trask	34		47	62.5%	7	37.5%	4	0.0%	-	12	42.3%	8	57.7%	11	19
Wizard/Falls River	50		5	0.0%	-	22.0%	4	78.0%	15	19	42.3%	3	57.7%	4	7
Rock Creek	34		45	62.5%	7	37.5%	4	0.0%	-	12	42.3%	8	57.7%	11	19
Total		473		696		55	60		141	256		83		113	196

Hatchery	Maintenance					Total Operations, Support, and Maintenance
	Housing	Emergency	R&E	Bond	Wildfire	
	100% OF	100% OF	100% OF	100% GF	100% OF	
Alea	8	4	64	24		864
Bandon	6	4	64	24		697
Cedar Creek	7	4	64	24		793
Clackamas	10	4	64	130		1,431
Elk River	5	4	64	24		787
Klamath	5	4	64	24	260	965
Nehalem	9	4	64	24		721
Oak Springs	8	4	64	24		1,037
Roaring River	9	4	64	24		982
Salmon River	7	4	64	24		829
Trask	9	4	64	24		686
Wizard/Falls River	17	7	129	48		1,046
Rock Creek	-	4	64	24	900	1,632
Total	98	50	900	440	1,160	12,469

- Notes: 1. Amounts in thousands.
2. GF General fund
OF Licenses and fees
FF Federal fund including Mitchell Act, US Army Corps of Engineers and Sport Fishing Restoration
Other PGE, Douglas County, hydroelectric sales

Appendix C
Hatchery Location Maps

Map C.1
 Washington Department of Fish and Wildlife Hatchery and Rearing Facilities



Map C.2

Fish Hatcheries Operated by the Oregon Department of Fish and Wildlife

Ownership

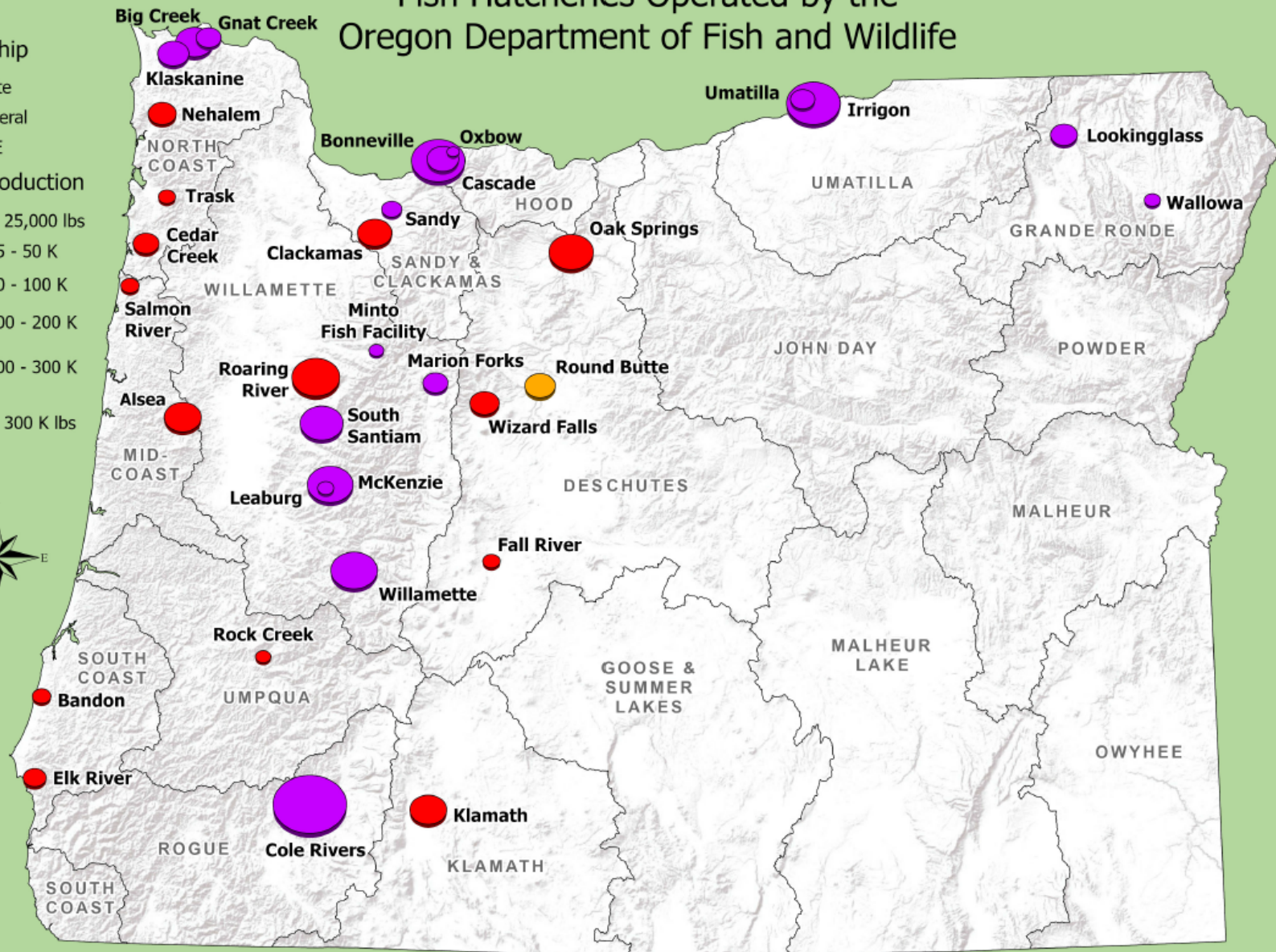
- State
- Federal
- PGE

2022 Production

- < 25,000 lbs
- 25 - 50 K
- 50 - 100 K
- 100 - 200 K
- 200 - 300 K
- > 300 K lbs



0 25 50 100 Miles



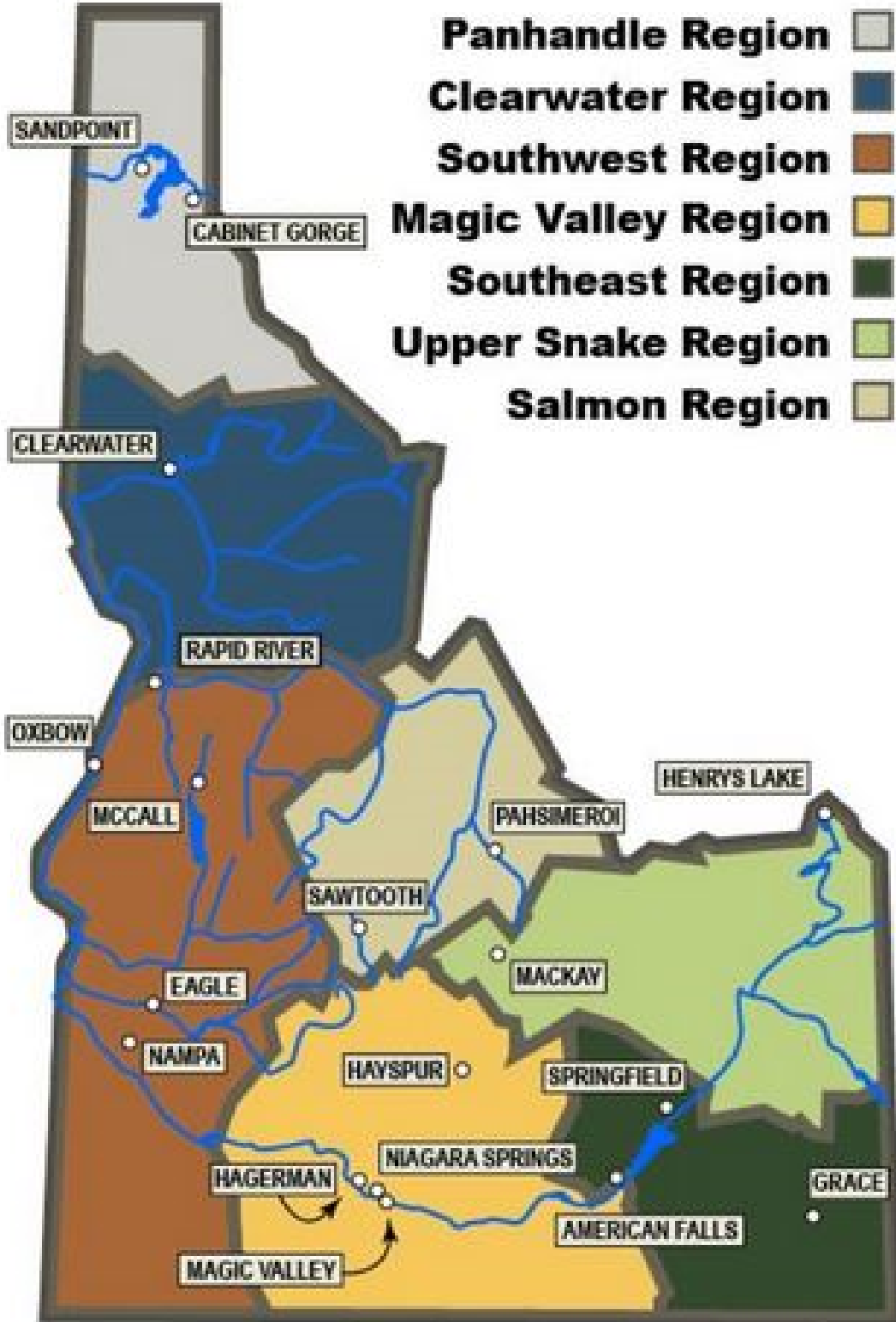
Map C.3
California Department of Fish and Wildlife Fish Hatchery Locations



Hatchery Locations



Map C.4
Idaho Department of Fish and Game Hatcheries



**Table C.1
Surrounding States Annual Hatchery Revenue Budgets**

Washington Department of Fish and Wildlife

FY24	Amount	Share
Flexible Funding		
General Fund - State	24,926,968	36.3%
Fish, Wildlife, and Conservation Acct	4,300,581	6.3%
Aquatic Lands Enhancements Acct (ALEA)	1,318,510	1.9%
Dedicated/Restricted Funding		
Regional Fisheries Enhancement Group (PSRFE)	1,189,755	1.7%
Warm Water Game Fish Account	110,685	0.2%
Limited Fish and Wildlife Account - Two-Pole Fund	2,024,719	3.0%
Model Toxics Control Operating Account (MTCA)	138,625	0.2%
Climate Commitment Account	125,000	0.2%
Contract Funding - Total Dollars		
RCO	815,365	1.2%
Local		
Chelan County PUD	3,987,388	5.8%
City of Tacoma	5,512,788	8.0%
Grant County PUD	982,819	1.4%
PacifiCorp	2,904,085	4.2%
Seattle Public Utilities	775,272	1.1%
Other GF - Local	1,816,486	2.6%
Federal		
ACOE	1,896,025	2.8%
BPA	779,530	1.1%
BPA - SAFE	402,799	0.6%
NOAA Mitchell Act	5,315,309	7.7%
NOAA - PST	4,514,967	6.6%
USFWS - DJ	1,791,414	2.6%
USFWS - LSRCP & Lyons Complex	<u>2,987,854</u>	<u>4.4%</u>
Total	68,616,944	100.0%

Notes: Acronyms:

- RCO - Washington State Recreation and Conservation Office
- ACOE - US Army Corps of Engineers
- LSRCP - Lower Snake River Compensation Plan

California Department of Fish and Wildlife

FY 2023-24	Amount	Share
General Fund	6,332,000	12.1%
California Environmental License Plate Fund	1,000	0.0%
Fish and Game Preservation Fund	3,875,000	7.4%
Federal Trust Fund	5,468,000	10.5%
Reimbursements	8,650,000	16.5%
Hatchery and Inland Fisheries Fund	26,037,000	49.8%
California Emergency Relief Fund	1,912,000	3.7%
Total	52,275,000	100.0%

- Notes: 1. Federal Trust Fund includes SFR, USCOE, NOAA Fisheries, Bureau of Reclamation and other federal sources.
2. Reimbursements are non-federal fund sources. Examples are:
- a. Pacific Gas & Electric Company. Agreements for trout stocking mitigation included in FERC license agreements.
 - b. Siskiyou Power Authority. Agreement for anadromous fish and trout stocking included in FERC license agreement.
 - c. Negotiated agreement between CDFW and San Francisco Public Utilities Commission for a temporary water treatment system during repairs to the Hetch Hetchy tunnels.
 - d. California Department of Water Resources. Mitigation agreement to operate Feather River Hatchery to produce Chinook salmon and steelhead. Also to conduct genetic identification of juvenile salmon at various locations in the valley to help inform to help inform California State Water Project operations.

Oregon Department of Fish and Wildlife

FY 2023-25 (annual)	Amount	Share
General fund	3,487,678	7.9%
Other Fund License /3	5,867,645	13.3%
Other Fund Obligated /4	4,565,060	10.3%
Other Fund Dedicated /5	544,120	1.2%
BPA	4,210,999	9.5%
USCOE	11,979,834	27.1%
LSRCP	4,090,181	9.3%
MA	6,242,415	14.1%
SFR	2,160,542	4.9%
PSC, PSMFC, PST, NOAA	<u>1,065,393</u>	<u>2.4%</u>
Total	44,213,866	100.0%

Notes: 1. Acronyms:

- SAFE - Select Area Fisheries Enhancement Program (Lower Columbia River net pen project)
 - PGE - Portland General Electric
 - PSMFC - Pacific States Marine Fisheries Commission
 - PST - Pacific Salmon Treaty
 - NOAA - National Oceanic and Atmospheric Administration Fisheries
 - MA - Mitchell Act
 - BPA - Bonneville Power Administration
 - LSRCP - Lower Snake River Compensation Plan
 - USCOE - U.S. Army Corps of Engineers
 - COP - City of Portland
 - SFR - Sports Fishing Restoration (manufacturers federal excise taxes on sport fishing equipment, import duties on fishing tackle and pleasure boats, and the portion of the gasoline fuel tax attributable to small engines and motorboats)
2. Includes \$1.0 million for hatchery independent resiliency assessments.
3. PGE, Idaho Power, COP, Pacific Corps, Douglas County, Burns Paiute, egg and carcass sales, Wasco Electric-hydro, Cow Creek.
4. SAFE.

Idaho Department of Fish and Game

FY24	Amount	Share
License	5,739,350	32.4%
BPA	1,048,496	5.9%
DJ	1,253,791	7.1%
LSRCP	6,599,345	37.2%
IPC	3,022,990	17.0%
PSMFC	69,249	0.4%
State	-	
Total	17,733,221	100.0%

Notes: Acronyms:

- License - Dedicated funds from IDFG
- BPA - Bonneville Power Administration
- DJ - Dingell-Johnson Act, otherwise known as Sport Fish Restoration Act
- LSRCP - Lower Snake River Compensation Plan
- IPC - Idaho Power Company
- PSMFC - Pacific States Marine Fisheries Commission
- State - State General Fund (IDFG receives no general fund tax revenue)