Coho Salmon Recovery In California: A Summary Of Recent Economic Evidence

by

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In 2003, with the input of stakeholders, the California Department of Fish and Game created the Recovery Strategy for California Coho Salmon, a guide for the process of recovering coho salmon on the north and central coasts of California. In this article we summarize our estimates of both the fiscal cost and the socioeconomic impacts of implementing the Coho Salmon Recovery Strategy (Recovery Strategy) for the Central California Coast (CCC) Coho Evolutionary Significant Unit (ESU) and the California portion of the Southern Oregon-Northern California Coast (SONCC) Coho ESU.

The Coho Salmon Recovery Strategy prepared under the direction of the California Department of Fish and Game (the Department) lays out actions to be taken in order to recover the coho in California. We estimated the cost of implementing the recovery strategy. In this note we summarize our estimates of both the fiscal cost and the socioeconomic impacts of implementing the Coho Salmon Recovery Strategy (Recovery Strategy) for the Central California Coast (CCC) Coho Evolutionary Significant Unit (ESU) and the California portion of the Southern Oregon-Northern California Coast (SONCC) Coho ESU. We find that the absolute costs of recovery, estimated to be about $5 billion, depend to a large extent on the amount of water acquired to improve in-stream flows for coho in the SONCC, which is unknown at this time. The magnitude of the cost estimate is typical for species that require changes in land use for habitat restoration.

We also find that publicly-financed coho recovery requires transferring state resources from urban centers to rural counties in California, potentially creating important new job opportunities in areas with structural unemployment. Whether the fiscal costs of recovery in these regions are borne by the private landowners or the public sector depends on the important unresolved role of increased enforcement of permits and take restrictions. Private timber landowners are likely to bear higher costs than private agricultural landowners.

Methodology

The fiscal or budgetary cost of a recovery action is the expenditure needed to physically perform the action. The socioeconomic impact of a recovery action includes income foregone because the recovery action is undertaken, and transfers to the local region (called a Hydrological Unit [HU]) from outside the region because the recovery action is undertaken. We present fiscal cost impacts of the various recovery recommendations as the current dollar cost of completing the project now. Though we know that in practice activities will take place under many conditions and at many different points in time, little is known about the specific sequencing of recovery recommendations or how state obligations would be financed. In order to develop cost and impact assessments, our primary unit of analysis is the hydrologic sub-area (HSA), a sub-unit of the HU.

Table 1: Estimated Recovery Costs by Hydrological Unit

Hydrological Unit	Cost ($1,000)
Big Basin	253,907
Bodega	17,574
Cape Mendocino	146,916
Eel River	612,527
Eureka Plain	22,403
Klamath River	849,118
Mad River	26,176
Marin Coastal	57,802
Mendocino Coast	780,043
Redwood Creek	23,866
Rogue River	7,035
Russian River	265,194
San Francisco Bay HUs	130,565
San Mateo	63,271
Smith River	21,865
Trinidad	21,865
Trinity River	564,392
Winchuck River	2,827
Total SONCC (w/o Scott/Shasta)	1,680,502
Total CCC	1,465,139
Total SONCC/CCC Restoration Costs	3,954,195
Total Scott/Shasta Restoration	371,584
Total Restoration Incl. Scott/Shasta	4,325,778

Source: Authors' calculation. Habitat restoration includes removal of barriers to fish passage, riparian revegetation and stream bank improvements, placement of LWD and improvements in instream complexity, and road treatment and decommissioning. Scott/Shasta is Shasta Valley and Scott River HSAs.

We estimated the unit cost of recovery recommendations common to many HSAs and identified ways in which costs vary systematically across HSAs. The commonly recommended recovery recommendations for which unit cost estimates were developed are:

- Removing or alleviating barriers to fish passage;
- Implementing riparian revegetation and other Ê stream bank improvements; Ê
- Improving in-stream complexity;
- Road treatment and/or decommissioning;
- Water acquisitions;
- Undertaking biological studies of salmon behavior;
- Watershed planning, and
- Education and outreach efforts.

We developed aggregate cost estimates for common recovery recommendations with a series of restoration cost models. These models combine unit cost estimates with information on the potential scale at which recommended activities could be undertaken when known (provided by the Department) and information about the ways that unit costs are likely to vary across HSAs. The socioeconomic impact that will occur as a result of habitat restoration is calculated as the amount of regional transfers stemming from these activities. These equal total fiscal costs less project costs attributable to permitting, planning and mobilization estimated from historical project budgets.

A major source of cost variation is likely to come from regional differences in wage rates since labor costs form a large part of the total unit cost of most recovery recommendations. Data on average wages paid to construction workers in California counties were used to identify how recovery costs are likely to vary across HSAs as a result of labor costs. We mapped the county-level wage data to HSAs using GIS.

Table 2: Range-Wide Costs

Cost Category	Cost ($1,000)
Monitoring, evaluation and planning	
Total excl. Scott/Shasta	44,000
Total Scott/Shasta	10,604
Total incl. Scott/Shasta	54,604
Education and outreach	
Total excl. Scott/Shasta	31,000
Total Scott/Shasta	8,833
Total incl. Scott/Shasta	39,833
Water management	
Total excl. Scott/Shasta	--
Total Scott/Shasta	10,334
Water use efficiency	
Total excl. Scott/Shasta	--
Total Scott/Shasta	3,200
Water acquisition	
Total excl. Scott/Shasta	UNKNOWN
Total Scott/Shasta	60,218
Other	
Total excl. Scott/Shasta	0
Total Scott/Shasta	1,245
(Best management practices)	
Timberland management	
	FEW INCREMENTAL COSTS

Source: Authors' calculation.
Scott/Shasta is Shasta Valley and Scott River HSAs

Table 3: Total Estimated Costs of Coho Salmon Recovery

Total Southern Oregon/Northern California Coho Costs, excluding Water ($1,000)	4,492,195
Total Scott/Shasta Costs ($1,000)	466,017

Source: Authors' calculation. Scott/Shasta is Shasta Valley and Scott River HSAs. No cost estimates are available for water acquisition in the CCC or SONCC excluding the Scott/Shasta. Excludes costs identified but not quantified.

Aggregate Cost Estimates

Tables 1 through 3 summarize the measured fiscal cost of coho recovery in California. Habitat restoration costs are presented by hydrological unit; other costs are presented on a range-wide basis. Tables 4 and 5 summarize the measured socioeconomic impacts of coho recovery. Habitat restoration impacts are presented by HU, while other costs are presented on a range-wide basis. These estimates include the cost of recovery in Scott/Shasta (the Shasta Valley and Scott River HSAs), which is shown separately.

The aggregate cost estimates presented in Tables 1 through 3 include not only the cost of performing recommendations that are common to many HU/HSAs, but also the cost of specific tasks that respond to the unique circumstances of each HU/HSA. Some of these items are a significant portion of the costs estimated here. For example, restoring coarse sediment transport near Iron Gate Dam (in the Klamath River HU) may cost as much as $500 million.

Restoration costs are higher in the SONCC Coho ESU than the CCC Coho ESU, likely because coho salmon are more widely distributed within the SONCC Coho ESU. An important unmeasured cost is the cost of water acquisition outside of Scott/Shasta. These costs

are likely to be significant, especially in the SONCC, as are the associated socioeconomic impacts.

Monitoring, evaluation, planning, and education and outreach costs are about $90 million dollars; about two percent of total estimated fiscal costs.

The timberland management strategy proposal adopted by the Commission of Fish and Game entails land-use restrictions that will have costs around $1.7 billion. Because of the way we estimated the cost of habitat restoration, these costs are not in addition to the costs that we estimated, but subsumed in our estimates of the cost of recovery activities. This is a controversial, and costly, element of the recovery strategy that will have negative socioeconomic impacts, including timber employment impacts.

Restoration activities can generate positive socioeconomic impacts. Socioeconomic impacts generated from restoration equal about one-half of the fiscal costs of restoration or $2.1 billion. The socioeconomic impacts of water acquisition in the SONCC range will be negative (for Scott/Shasta these negative impacts equal about $6 million).

Table 4: Socioeconomic Impacts of Restoration

Hydrological Unit	Impacts ($1, 000)
Big Basin	157,582
Bodega	6,867
Cape Mendocino	87,121
Eel River	346,282
Eureka Plain	5,404
Klamath River	219,665
Mad River	15,304
Marin Coastal	36,888
Mendocino Coast	465,156
Redwood Creek	12,976
Rogue River	4,980
Russian River	169,652
San Francisco Bay HUs	82,074
San Mateo	42,082
Smith River	68,696
Trinidad	15,330
Trinity River	247,326
Winchuck River	1,918
Total SONCC (w/o Scott/Shasta)	1,082,3388
Total CCC	902,966
Total SONCC/CCC Restoration Costs	1,985,304
Total Scott/Shasta Restoration	159,296
Total Restoration Incl. Scott/Shasta	2,144,600

Source: Authors' calculation. Scott/Shasta is Shasta Valley and Scott River HSAs. Habitat restoration includes removal of barriers to fish passage, riparian revegetation and stream bank improvements, placement of LWD and improvements in instream complexity, and road treatment and decommissioning.

Outstanding Policy Issues

Moving from a Recovery Plan to Species Recovery. While our partial estimates of the cost of coho recovery are subject to uncertainty, the magnitude of the estimated cost of recovery is striking. The total estimated cost of recovery, $5 billion, is sufficiently high that it makes complete funding of this plan politically difficult. Even if a large portion of these costs is borne by private landowners, state funding of even a fraction of recovery could be a tough sell in Sacramento.

High species recovery costs are not unique to coho. Other estimates of the cost of species recovery, such as the spotted owl, have been of similar orders of magnitude. Costs are particularly high for the recovery of species where changes in land use are needed for habitat restoration. The high cost of recovery of species is largely responsible for the fact that few species have been recovered since the introduction of the Endangered Species Act. Coho salmon in California may be no exception.

Regional Equity Implications. The costs of coho recovery are not spread equally across California, or even across the coho range. Klamath, Trinity River and Mendocino HUs combined account for over 85 percent of measured restoration costs. A large fraction of costs will also be incurred in Scott/Shasta. Using the current level of information on the recommendations contained in this strategy, about $466 million, or nine percent of total costs will be incurred to implement recovery in the Scott and Shasta Valleys. While currently we do not know the cost of water acquisition in the SONCC outside of Scott/Shasta, if it is about 20 percent of total costs (as it is in Scott/Shasta), a disproportionate share of costs will still be incurred in Scott/Shasta.

The concentration of the recovery effort in a limited number of relatively rural areas has important regional equity implications. To the extent that coho recovery is financed by private landowners, these costs will be borne by rural residents. Since endangered species recovery has benefits for all residents of California (and all residents of the United States to a lesser extent), this amounts to a resource transfer from landowners in rural counties to urban Californians.

When recovery is financed by tax dollars, the situation is reversed. In this case, California tax revenue will provide state-wide benefits as a result of coho recovery, but it will also be used to subsidize economic

activity in counties like Trinity and Mendocino. Restoration activity in particular will create jobs, at least in the short run. However, water acquisition efforts that result in fallowing and restrictions on timber harvest will have net negative impacts on economic activity in the same areas.

If the regions where restoration will be focused were in full employment, the generation of economic activity as a result of coho recovery efforts could increase the demand for labor and increase wage rates. While job creation is a real prospect, we consider wage impacts to be minimal. Most of the regions in which the bulk of the recovery recommendations will take place face structural unemployment.

Permitting Enforcement vs. Incentive Payments. A critical outstanding issue for the financing of coho recovery is the question of the division of responsibility between the public and private sectors. There is little question that the budgetary costs of coho salmon recovery to taxpayers can be reduced, dramatically in some cases, if state agencies undertake more rigorous enforcement of existing permits. For example, there is some amount of unpermitted water diversion from streams containing coho salmon, and some diverters use more than their allowable quantity. To take another example, existing take restrictions may require that ranchers be fencing and constructing troughs more than is currently the case.

The Recovery Strategy, as currently presented, says little about reducing unauthorized diversions of water. As discussed in the case of Scott/Shasta, the strategy appears to envision increasing in-stream flows for coho through voluntary measures, water acquisitions and the use of alternative sources.

In contrast, the Recovery Strategy imposes significant costs on the timber sector, where unauthorized logging is unlikely to be occurring. There is no analogous scheme of incentive payments to be made to timber harvesters like the payments to be made for water acquisitions. Instead, private timber firms will bear increased costs as a result of stricter harvest limits.

The reason for the unequal treatment of the timber and agricultural sectors is unclear. Regulatory oversight of the timber sector may be easier to achieve or politically more feasible. In other contexts it has also been the case that the allocation of funding among various environmental objectives is affected by the identity of the likely recipients of these funds. For example, there is a significant amount of Federal Conservation Reserve Program funding that is received by farmers in the Dakotas and Texas while miniscule amounts are allocated to procure environmental benefits in locations in the Southwest, despite the existence of substantial environmental amenities that could be preserved in that region.

Table 5: Range-Wide Measured Socioeconomic Impacts

Cost Category	Impact ($1,000)
Monitoring, evaluation and planning	
Total excl. Scott/Shasta	0
Total Scott/Shasta	0
Total incl. Scott/Shasta	0
Education and outreach	
Total excl. Scott/Shasta	0
Total Scott/Shasta	0
Total incl. Scott/Shasta	0
Water management	
Total excl. Scott/Shasta	--
Total Scott/Shasta	0
Water use efficiency	
Total excl. Scott/Shasta	--
Total Scott/Shasta	2,020
Water acquisition	
Total excl. Scott/Shasta	UNKNOWN
Total Scott/Shasta	(6,143)
Other	
Total excl. Scott/Shasta	0
Total Scott/Shasta	0
Timberland management	
	FEW INCREMENTAL IMPACTS

Source: Authors' calculation. Scott/Shasta is Shasta Valley and Scott River HSAs. No socioeconomic estimates are available for water acquisition in the CCC or SONCC excluding the Scott/Shasta.

Conclusion

Our analysis is only one step toward a cost-effective plan for recovering the coho and placing coho recovery in the context of broader environmental policy in California. The uncertainty associated with our estimates of the cost of recovery is matched by uncertainty about the benefits for coho of recovery actions. Without information about these impacts, the cost estimates that we have developed cannot be used to perform a cost-benefit analysis. Further economic and biological research is needed to achieve this goal.

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