THE VALUE OF PROTECTING AND RESTORING THE DUCKABUSH ESTUARY

EAST JEFFERSON COUNTY, WASHINGTON

IMPACT SUMMARY

$75M-$250M
in ecosystem services benefits over 100 years

- **$57M-$194M** in benefits *gained*
- **$18M-$56M** in benefits *protected*

JOBS

449 local jobs
supported per year of the project, 1.54% of the employable population.

400,000 Chum Salmon
additionally supported by improved nursery habitat

THE DUCKABUSH ESTUARY **RESTORATION PROJECT**

The US 101 is an essential highway, connecting residents of Jefferson County, Washington to the wider region—but has bisected the Duckabush Estuary for almost 100 years. The Duckabush Estuary Restoration project will replace the causeway that currently crosses the estuary with a 1,600-foot-long full spanning bridge, essentially raising the road profile. The project would improve resiliency of the new bridge over its 100-year lifespan, helping residents weather flooding and changing climate. It would also provide essential wildlife and salmon habitat by reconnecting the Duckabush River to neighboring floodplains and wetlands, while creating a wildlife corridor under the new bridge.

The estuary's natural habitat also provides benefits, called ecosystem services, for the local community—space for recreational activity like hunting and wildlife watching, improving water quality, habitat for shellfish for harvesting, and supporting keystone salmon species. The reconnected channels will return the estuary to a fully functioning ecosystem, protecting the benefits it already generates as well as adding additional value as the estuary returns to a fully functioning ecosystem. Earth Economics estimated the restoration of the Duckabush Estuary to protect and create at least **$249.6 million** in ecosystem services or **$75.4 million** when discounted at a 3% rate over the 100-year life span of the bridge—reflecting that dollars spent today are worth less over time. This is an underestimation of the value of the restoration work, as not all ecosystem services provided by the estuary and restoration work were able to be valued.

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ECONOMIC BENEFITS OF RESTORING THE ESTUARY

Ecosystem Services are the non-market benefits that nature provides to people, free of charge—natural systems produce water, clean air, food, and vital goods and services that support human well-being and support communities. The economic benefits people receive from these services can be measured in a variety of ways, including by avoided adverse health impacts, changes in productivity, and avoided property loss, as well as through the ripple effect of restoration spending through the local economy.

Translating the real-world benefits that ecosystems provide into dollars and ensuring that these values are properly accounted for in planning decisions is a growing best practice. If not done so, they are effectively valued at zero in the decision-making process. When these services are lost, they must often be replaced by more costly built alternatives.

Human activity and infrastructure development at the Duckabush estuary, for instance, has inhibited the natural flood protection benefit offered by healthy wetlands, which in turn required berms and culverts to protect highway infrastructure. Development has also impeded the ingress of chum salmon to their spawning grounds, a keystone species that provides for countless other species and the overall health and function of the coast.

The Duckabush restoration is an investment in improving the estuary's ability to provide ecosystem goods and services by removing stressors that restrict its natural ability to support those functions.

HIGHLIGHTED ECOSYSTEM SERVICES
PROVIDED OVER THE BRIDGE'S LIFESPAN

ADDITIONAL VALUE

FLOOD RISK REDUCTION
+$29K to **$90K**

AVOIDED ROAD FLOODING
+$8K to **$54K**

CHUM SALMON VALUE in Puget Sound
+$30M to **$109M**

AESTHETIC BENEFITS for residents
+$27M to **$84M**

WATER QUALITY improvement from bioswales
+$125K to **$386K**

VALUE OF VOLUNTEER TIME
+$54K to **$60K**

PROTECTED VALUE

RECREATION VALUE
$5M to **$15M**

HABITAT FOR WILDLIFE
$7M to **$21M**

WATER QUALITY improvement from wetlands
$4M to **$14M**

CARBON SEQUESTRATION
$577K to **$2M**

RESILIENCY

High-tide flooding (or nuisance flooding) affects traffic in many US coastal areas. Moreover, sea level rise and changing rain patterns are likely to make the issue more problematic in the future.

FLOOD RISK REDUCTION – The new bridge is engineered to pass 100-year river flood events and account for projected sea-level rise, providing a total annualized benefit of $897 per year in avoided flood damage to nearby residents.

AVOIDED ROAD CLOSURES – Raising the road profile of Highway 101 would reduce maintenance costs by $8,000-$54,000 over the lifespan of the bridge.

STORMWATER MANAGEMENT – The project includes three bioswales that together account for an area of approximately 174 square meters. Earth Economics valued the contribution of the bioswales in terms of reduced stormwater management costs as $3,600 to $4,100 annually.

SOCIAL BENEFITS

THE VALUE OF VOLUNTEER TIME – Volunteers have participated in programs monitoring birds, vegetation, water quality, and sediment since 2020. They are expected to continue for five years post-construction. The total value of volunteer time is estimated at $60,000.

INCREASED AESTHETIC BENEFITS FOR RESIDENTS – Areas of natural beauty hold significant value for residents and visitors who enjoy and appreciate the scenery, sounds, and smells of nature. Homes are often higher in value the closer they are to natural amenities. The aesthetic benefit of the estuary is valued at $27.5 million to $84.49 million.

RECREATIONAL VALUE – A range of recreational activities take place at the Duckabush Estuary. Waterfowl hunting and big game hunting—including a local population of elk—occur within the estuary and surrounding area. Recreational angling occurs in the estuary and in the nearby Hood Canal waters. Local wildlife—including seals, birds, and more—contribute to wildlife watching. The scenic area provides a picturesque location in which to participate in sightseeing, picnicking, photography, and more. Recreation provides $4.9 million to $15.1 million in benefits to estuary users.

BENEFITS TO THE ENVIRONMENT

CARBON SEQUESTRATION – Natural lands can remove atmospheric carbon dioxide—a greenhouse gas—contributing to increased climate stability. Through carbon sequestration, nature provides benefits by reducing the damage of greenhouse gases—such as agricultural losses, impacts to human health, and increased disaster risk. The ecosystems in the Duckabush Estuary are estimated to provide $577,000 to $1.7 million in climate stability benefits.

HABITAT FOR WILDLIFE – The estuary provides shelter for wildlife, promoting growth of species and maintaining biological diversity. Elk visit the area to graze, and seals are frequent visitors. Habitat was valued at $6.7 million to $20.6 million. Not measured were infrastructure changes that will enable greater accessibility, such as removal of the culverts to extend the range of seals.

IMPROVED WATER QUALITY – Natural wetlands help maintain good water quality by processing and removing suspended and dissolved nutrients, solids, and other contaminants from surface and ground water—benefitting both human and animal water uses. This natural filtration was valued at $4.4m to $13.6m over the lifespan of the bridge.

SALMON POPULATION

The Duckabush estuary is an important nursery habitat for fish species, including chum, chinook, pink, and coho salmon, and steelhead. Hood Canal Chum salmon are an ESA-listed species dependent on estuaries like the Duckabush for rearing purposes. Using data from recent salmon monitoring efforts and guidance from experts, Earth Economics estimated the increase in chum salmon population based on a higher smolt-to-adult return rate (SAR) from improved estuary function. It's expected restoration will result in up to 4,300 additional returning adults each year, almost double the current SAR. Over 100 years, this will total an additional 400,000 fish.

CHUM SALMON VALUE – Based on previous studies that measured households' willingness to pay for the existence of Coho salmon on the Oregon coast, increased chum salmon would be worth $29.5 million to $108.9 million to residents of the Puget Sound.

BENEFITS TO THE **LOCAL ECONOMY**

Project spending will also benefit residents. Earth Economics calculated averages for the jobs created by the project per year. This method avoids double counting jobs that last more than one year. The project would create 449 jobs per year or 1.54% of Jefferson County's employable population (above 16 years old).

- **143 DIRECT JOBS** per year in industries directly supported by Duckabush restoration investments, such as construction, engineering services, and retail.
- **147 INDIRECT JOBS** per year in industries that support companies that contract with the restoration project directly.
- **159 INDUCED JOBS** per year created by direct and indirect employees spending their paycheck on rent, gas, and groceries at local businesses.

LARGER IMPACTS OF RESTORING THE ESTUARY

The importance of the Duckabush estuary as part of the larger Hood Canal and Puget Sound ecosystem should not be underestimated. The estuary plays a role as a stopping point for salmon populations migrating further into the sound, and its restoration will support an increase in salmon abundance, ultimately removing the need for protected status for certain species. Everyone benefits when we move towards delisting a species.

Our valuation focuses only on chum salmon to the residents of the Puget Sound. Other salmon species, like the Chinook, a main food source for endangered Southern Resident Killer Whales, should increase post-restoration. It could be argued that all residents of Washington state would benefit from increased numbers of these keystone species.

Shellfishing is a significant recreational and tribal activity at Duckabush. Restoration will change the estuary's hydrology and may affect distribution of shellfish and their abundance. If water quality improves, the estuary may open for shellfishing all year round, increasing the value of harvesting. A range of recreational activities take place at the Duckabush Estuary, which we were not able to measure due to a lack of data.

Earth Economics' study measured land cover immediately post-restoration, not the final state of equilibrium the estuary will reach after channels are reconnected, which may create further value, and we did not measure every ecosystem service provided by restoration due to lack of data. Thus, **the total ecosystem service value presented here should be viewed as a minimum value of what would be provided.**

Earth Economics works to quantify and value the benefits nature provides - our work drives effective decisions and systemic change through a combination of education, natural capital analysis, and policy recommendations.
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