

THE ECONOMIC IMPACT OF RESTORING THE BIG QUILCENE RIVER FLOODPLAIN



QUILCENE, WASHINGTON

IMPACT SUMMARY

\$3.2 million

in ecosystem services benefits *protected* per year

\$500 thousand

in ecosystem services benefits *added* per year

255 local jobs

supported by the restoration projects

\$14 million

in local wages supported by the projects

\$1.6 million

in state and local tax revenue generated by the projects

\$20 million

in local GDP supported by the projects

THE RESTORATION PROJECTS

Hood Canal Salmon Enhancement Group (HCSEG) has planned two large-scale restoration projects to reconnect the Big Quilcene River to its historic floodplains:

- o **MOON VALLEY:** Acquire and restore 80 acres along the river in the Moon Valley. Restoration will include removing dikes and culverts to return the river channel to its natural, winding path, reconnecting the historic floodplain, raising the riverbed, and adding logjams.
- o **LOWER 1 MILE:** Reconnect the river to the north floodplain at Lower 1 Mile of the Big Quilcene River by removing the Linger Longer Road and bridge, the north levee, and Fremont Street; and constructing a new Rodger Street bridge and roadway south of the river.

THE ECONOMIC IMPACT

Earth Economics estimated the economic impacts of the two projects' market (e.g., jobs and GDP) and non-market benefits (e.g., ecosystem services):

- o **MARKET BENEFITS:** Together, the projects would support 255 jobs, \$14 million in wages, \$20 million in GDP, and **\$37 million in total economic activity in eastern Jefferson County**. Statewide, the projects would support an additional 60 jobs, \$3.8 million in wages, \$6 million in GDP, and \$11 million in economic activity. The projects would also generate **\$1.6 million in state and local tax revenue**.
- o **NON-MARKET BENEFITS:** The projects would protect a combined \$3.2 million in ecosystem services benefits per year. Lower 1 Mile restoration would add \$98,000 to \$228,000 per year in ecosystem services benefits, and Moon Valley restoration would add \$241,000 to \$548,000 per year.

Simply put, for every \$1 spent on Lower 1 Mile, \$1.17 to \$2.83 will be returned in ecosystem services benefits after 100 years; and for every \$1 spent on Moon Valley, \$6.58 to \$14.92 in benefits will be returned.



DISASTER RISK REDUCTION
+\$142,000 per year



RECREATION
+\$182,000 per year



HABITAT VALUE
+\$6,000 per year



WATER QUALITY
+\$152,000 per year



WATER STORAGE & SUPPLY
+\$26,000 per year



CLIMATE STABILITY
+\$9,000 per year

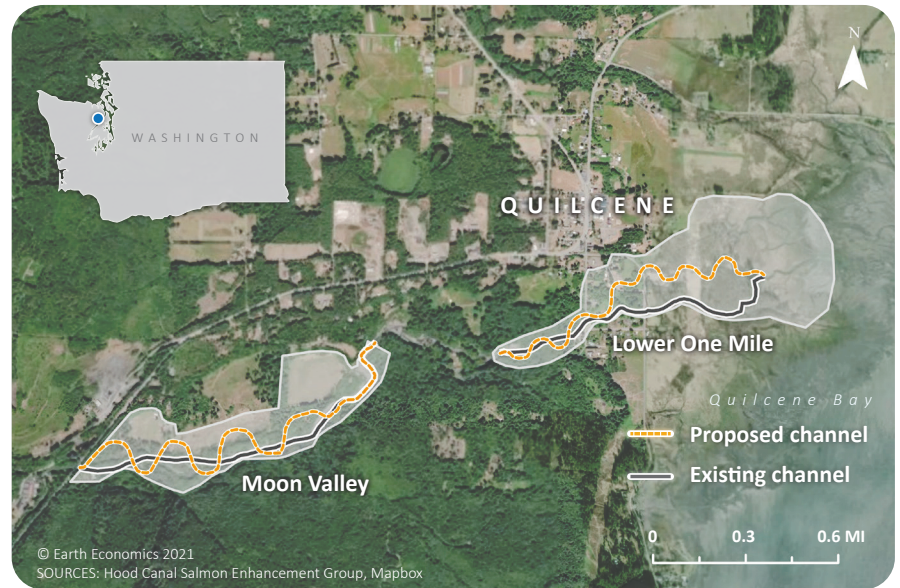
RESTORATION OF THE BIG QUILCENE RIVER FLOODPLAIN

Historically, the Big Quilcene River, a winding river that spreads out into the floodplain in Moon Valley, provided salmon habitat and diverse, thriving ecosystems. In the early 1900s, the river was artificially confined to a straight pathway using dikes and culverts to make room for farmland, which disconnected the river from its historic floodplain. These modifications accelerated the rate at which water and sediment flow downstream; today, these modifications and effects combine to cause frequent flooding in downstream communities and eliminate crucial spawning and rearing habitat for all species of salmon that reside in the Big Quilcene River.

The Hood Canal Salmon Enhancement Group (HCSEG) spearheads conservation and habitat restoration efforts on the Big Quilcene River, using easements and land acquisition to permanently protect areas of the floodplain and restore the benefits that a more natural floodplain provides. [HCSEG currently has two large-scale restoration projects planned](#) (the “projects”; Figure 1):

- o **MOON VALLEY:** Acquire and restore 80 acres along the river in the Moon Valley. Restoration will include removing dikes and culverts to return the river channel to its natural, winding path, reconnecting the historic floodplain, raising the riverbed, and adding logjams.
- o **LOWER 1 MILE:** Reconnect the river to the north floodplain at Lower 1 Mile of the Big Quilcene River by removing the Linger Longer Road and bridge, the north levee, and Fremont Street; and constructing a new Rodger Street bridge and roadway south of the river.

Figure 1. Planned project areas: Moon Valley and Lower 1 Mile.

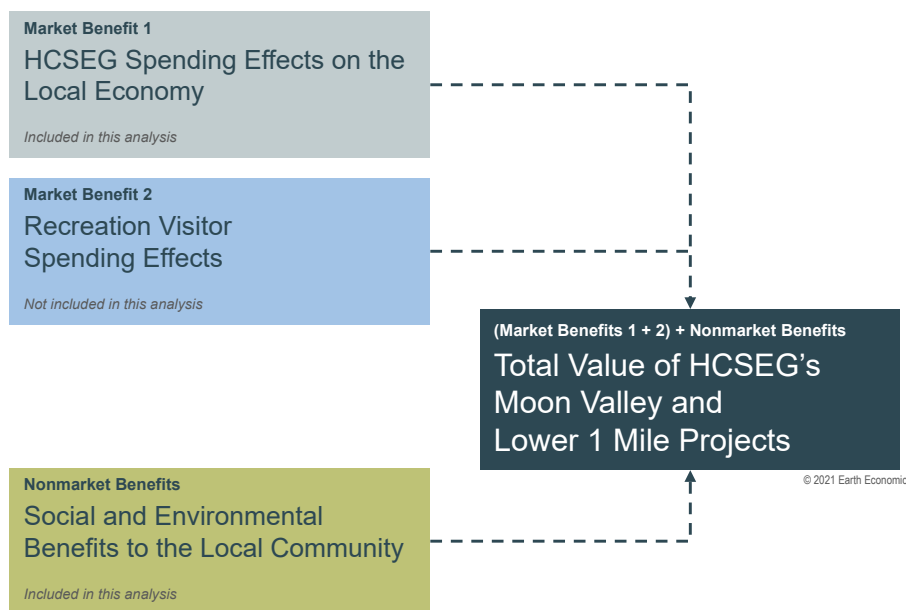


Credit: Hood Canal Salmon Enhancement Group

ECONOMIC BENEFITS OF RESTORING THE FLOODPLAIN

Earth Economics conducted an analysis of the economic benefits (both market and non-market) of the Moon Valley and Lower 1 Mile projects in eastern Jefferson County, Washington (Figure 2). Market benefits include local and state economic activity supported by project spending: jobs, amount of tax revenue generated, and total economic output. Non-market benefits are the economic benefits that nature provides to humans (also known as ecosystem services) – like the avoided flood damage after the floodplain is reconnected, or the cultural value of salmon habitat that will be restored.

Figure 2. Input-output modeling: market and non-market benefits.



MARKET-BASED ECONOMIC BENEFITS

Demonstrating how HCSEGE project spending supports additional economic activity in the region requires an economic contribution analysis, which examines how spending in one industry translates to additional spending in related industries, and the cumulative effect of that spending on the regional economy. Earth Economics conducts input-output modeling using local economic data from IMPLAN. The resulting analysis estimates the spending effect in terms of economic output, GDP contribution, number of jobs supported, labor income, and tax revenues for state and local government (Figure 3).

Figure 3. Economic contribution analysis effects—defined.

ECONOMIC OUTPUT

HCSEGE spending leads to additional spending within the region. The total economic activity by industries directly and indirectly supported by HCSEGE spending can be understood as the total economic output of that investment. Comparing total direct expenditures against total economic output shows how much economic activity is generated in the regional economy for every dollar invested in restoration.

VALUE ADDED

Value added—or GDP—is a subset of total economic output and is calculated by removing the value of intermediate inputs (e.g., raw materials, semi-finished goods, and business-to-business services) from the total economic output to better represent the value of final goods and services added to the regional economy.

JOBS

HCSEGE spending supports local employment beyond those who work directly for the organization. HCSEGE restoration spending spurs construction companies and retailers (among others) to expand their full- and part-time positions. Expenditures from these industries support jobs in industries that provide necessary services to these sectors, such as facilities maintenance, government services, real estate, and medicine.

LABOR INCOME

In addition to the number of jobs supported, the input-output model estimates the wages paid to workers whose jobs are supported by HCSEGE spending. These investments directly support wages in construction, forestry, and landscaping, as well as retail. As these employees pay for necessities such as food and housing, workers in other industries are also supported. Finally, as firms use the income from HCSEGE contracts to purchase the goods and services they need to function, the initial investment supports wages in other industries, such as wholesalers and business services.

TAX REVENUE

HCSEGE spending supports additional state and local tax revenues, typically in the form of sales and property taxes paid by the contractors and their employees.

The economic contribution analysis includes all HCSEG project spending from planning to construction. However, this analysis does not include economic impacts of increased recreational activity resulting from the projects. The economic effects are modeled for the local region of eastern Jefferson County (Figure 4).

The projects would support an estimated \$26 million in GDP, sustaining 314 jobs and \$17.8 million in wages in eastern Jefferson County and Washington State, combined (Table 1). About 255 of those jobs and \$14 million in wages would be in eastern Jefferson County, supported by the HCSEG restoration projects. Furthermore – about \$1.6 million in state and local tax revenue would be generated from the projects.

Figure 4. Local study region of eastern Jefferson County, WA census blocks used for the economic contribution analysis.



Moon Valley, Big Quilcene River
Credit: Hood Canal Salmon Enhancement Group

Table 1. Estimated economic contribution effects of spending by Hood Canal Salmon Enhancement Group on Moon Valley and Lower 1 Mile projects.*

DESCRIPTION**	JOBS	LABOR INCOME	VALUE ADDED	OUTPUT
MOON VALLEY, TOTAL	61	\$3,231,818	\$4,933,094	\$9,154,400
Local Direct Effect	35	\$2,246,169	\$2,963,439	\$5,343,150
Local Secondary Effect	17	\$397,703	\$1,009,604	\$1,987,913
State Direct Effect	3	\$161,300	\$212,809	\$383,699
State Secondary Effect	8	\$426,646	\$747,243	\$1,439,638
LOWER 1 MILE TOTAL	252	\$14,564,152	\$21,017,358	\$38,647,808
Local Direct Effect	114	\$7,375,493	\$9,730,712	\$17,544,702
Local Secondary Effect	89	\$3,997,355	\$6,161,570	\$11,933,981
State Direct Effect	8	\$529,644	\$698,776	\$1,259,909
State Secondary Effect	41	\$2,661,660	\$4,426,301	\$7,909,216
GRAND TOTAL	314	\$17,795,971	\$25,950,453	\$47,802,208

* Local and state economies defined as eastern Jefferson County and Washington State, respectively.

** Direct effects measure the economic activity of industries directly supported by HCSEG investments, such as construction, forestry services, and retail. Secondary economic effects are the shifts in the economy spurred by that initial investment, including business-to-business activities and employee spending.

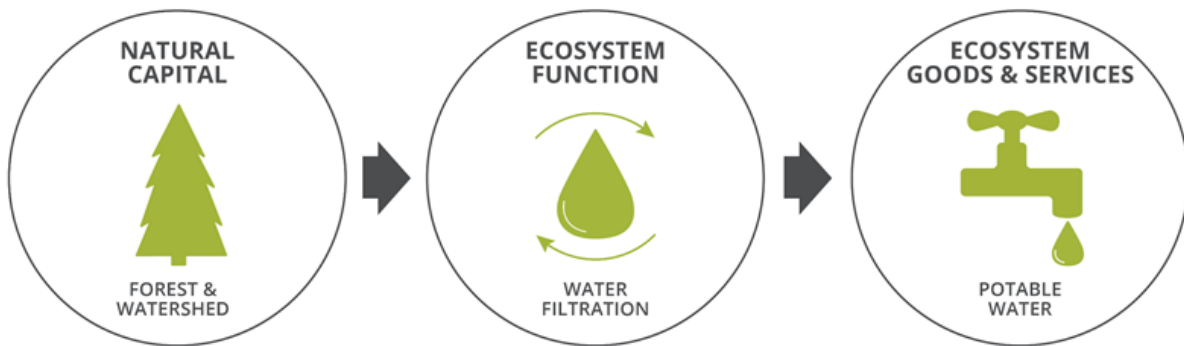
NON-MARKET: NATURE'S ECONOMIC BENEFITS

Simply put, ecosystem services are the non-market benefits that nature provides to people, free of charge. For example, natural systems produce water, clean air, food, and other vital ecosystem goods and services that support human well-being and sustain communities.

When land is converted from one type to another—like forest to cropland—ecosystem functions are altered, changing the suite of services provided (Figure 5). This change is critical to measuring the ecosystem services impact of proposed restoration projects like Moon Valley and Lower 1 Mile. Land-cover change analysis is performed by identifying and categorizing land-cover types, measuring how they change over time, and valuing those changes in monetary terms by mapping them on to the ecosystem services framework.

After identifying changes in land cover using available geospatial data, the next step is to identify the value of the ecosystem services produced by the land-cover types present in the study area. This process is facilitated by Earth Economics' internal EVTToolkit (EVT), a repository of over 5,000 individual ecosystem services value estimates drawn from scholarly literature, government reports, and other gray literature. EVT helps to construct appropriate comparisons between these studies and the area of interest by making it easy to select for characteristics such as climate type, ecosystem, and location. Querying EVT resulted in 64 value estimates that were appropriate for use in the HCSEG project areas.

Figure 5. Natural capital, ecosystem function, and economically valuable ecosystem goods and services.



Lower 1 Mile, Big Quilcene River
Credit: Hood Canal Salmon Enhancement Group

The proposed projects will add approximately 3,000 extra feet of channel and more than 50 acres of forest and wetland (Figure 6), changes that will **add more than \$500,000 in ecosystem services value each year and preserve \$3.2 million worth of existing ecosystem services value, across both projects.**

Table 2 shows the total annual ecosystem services benefits provided by service, pre- and post-project implementation, for each site. Compared to estimated costs, both projects yield positive returns when compared against ecosystem services in the long term. **Over 100 years, the Moon Valley and Lower 1 Mile projects provide a net benefit of \$220 million and \$121 million, respectively.** Moon Valley restoration begins to return positive benefits in 2 to 5 years, while Lower 1 Mile restoration returns positive benefits after 13 to 55 years. Table 3 shows the benefit-cost ratio of each project using different discount rates and time horizons. **For every \$1 spent on the Moon Valley project, \$6.58 to \$14.92 will be returned in ecosystem services benefits** after 100 years, and **for every \$1 spent on Lower 1 Mile, \$1.17 to \$2.83 in benefits will be returned.**

Though ecosystem services' full value is not generally reflected in market prices, they are fundamental to a functioning economy. While there may be concerns with assigning monetary values to ecosystems and natural processes, where decisions are based on budgets, net benefits, or returns on investment, failure to do so means that the contribution of nature to human wellbeing is effectively ignored. Consideration of these substantial additional benefits provided by projects like Moon Valley and Lower 1 Mile is a crucial step that shouldn't be skipped. Taking the value of ecosystem services into account ensures that investment decisions are made using more complete information. This analysis demonstrates the significant economic potential of these restoration projects to residents in eastern Jefferson County and Washington State as a whole.

Figure 6. Landcover of project areas, pre- and post-restoration

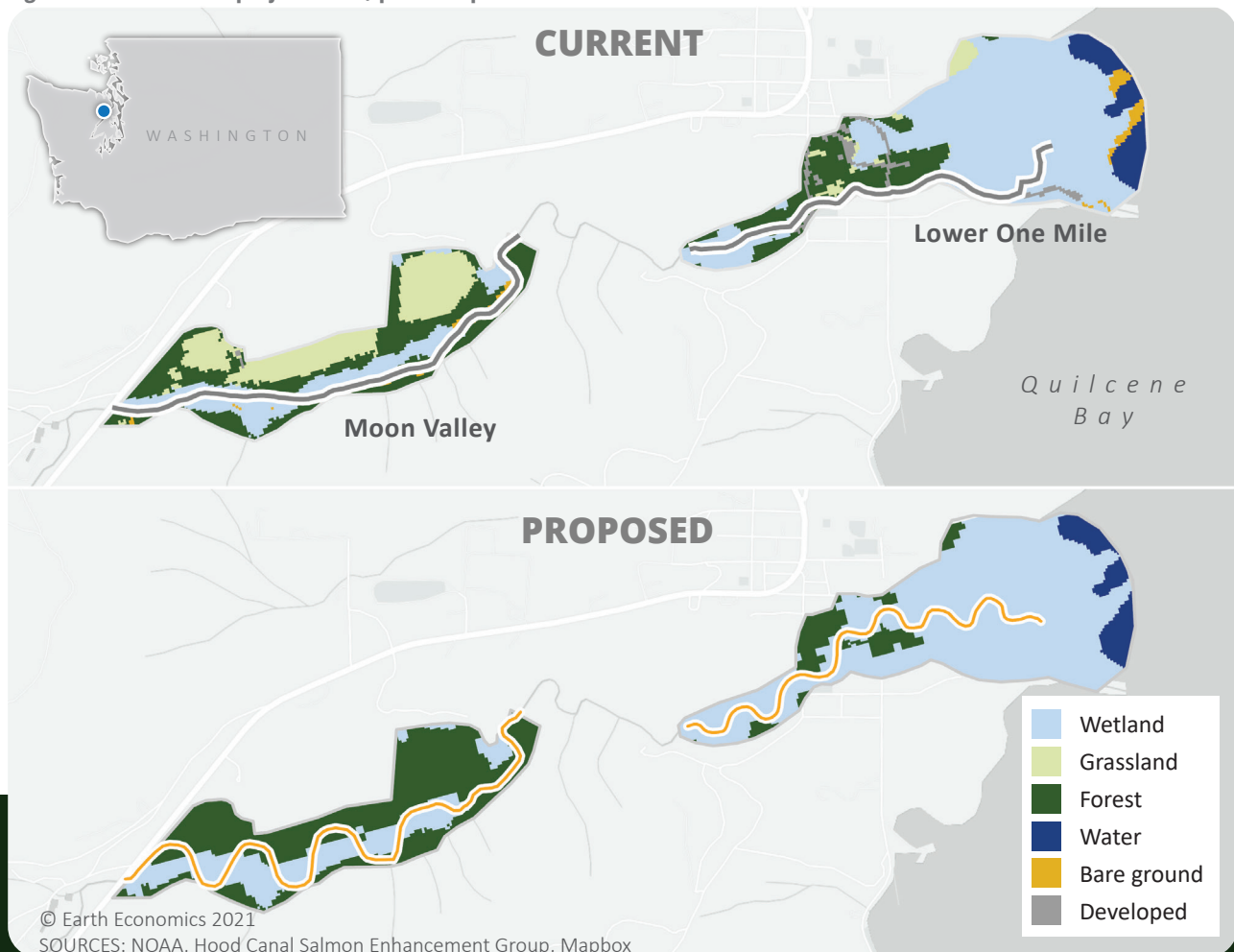


Table 2. Total annual ecosystem services values, pre- and post-project implementation.

PROJECT	ECOSYSTEM SERVICE	PRE-PROJECT			POST PROJECT		
		LOW \$	HIGH \$	AVERAGE \$	LOW \$	HIGH \$	AVERAGE \$
LOWER 1 MILE	Aesthetics	146	146	146	143	143	143
	Biological Control	18	200	109	0	0	0
	Climate Stability	5,295	36,814	17,775	4,927	36,727	17,618
	Cultural Value	8,118	9,330	8,562	9,097	10,284	9,532
	Disaster Risk Reduction	200,511	906,270	471,647	221,869	1,013,084	525,835
	Food	1	1,043	327	1	1,021	320
	Habitat	14,389	15,967	15,178	16,079	17,872	16,975
	Recreation	268,672	366,276	302,869	306,523	415,850	344,837
	Science/Education	133	133	133	130	130	130
	Soil Retention	988	1,119	1,053	21	149	85
	Water Supply	9,978	98,071	51,460	10,587	107,508	56,537
	Water Quality	319,052	555,041	432,359	356,046	611,924	479,396
	Water Storage	2,895	29,187	16,041	3,246	32,721	17,983
	LOWER 1 MILE TOTAL		830,195	2,019,596	1,317,658	928,669	2,247,412
MOON VALLEY	Aesthetics	392	392	392	531	531	531
	Biological Control	45	286	166	0	0	0
	Climate Stability	15,268	90,149	43,896	14,991	114,843	52,979
	Cultural Value	9,893	13,151	11,088	11,485	15,898	13,104
	Disaster Risk Reduction	243,645	1,100,255	572,734	278,521	1,271,765	660,102
	Food	4	2,803	878	5	3,797	1,189
	Habitat	19,142	21,412	20,277	23,000	25,893	24,447
	Recreation	555,510	674,975	597,252	688,358	827,235	736,841
	Science/Education	358	358	358	484	484	484
	Soil Retention	1,333	1,684	1,509	77	552	315
	Water Supply	18,324	144,286	74,416	23,457	176,282	90,538
	Water Quality	392,813	769,219	568,423	455,895	924,342	673,060
	Water Storage	3,514	35,425	19,469	4,074	41,076	22,575
	MOON VALLEY TOTAL		1,260,242	2,854,395	1,910,856	1,500,881	3,402,698

Table 3. Benefit-cost ratio of net ecosystem services benefits versus project costs over time at two discount rates.

PROJECT	DISCOUNT RATE	ESTIMATE	20 YEARS	50 YEARS	100 YEARS
LOWER 1 MILE	3%	Low	0.55	0.95	1.17
		High	1.33	2.31	2.83
		Average	0.87	1.51	1.85
	0%	Low	0.72	1.8	3.59
		High	1.74	4.35	8.7
		Average	1.14	2.84	5.69
MOON VALLEY	3%	Low	3.10	5.36	6.58
		High	7.02	12.15	14.92
		Average	4.70	8.13	9.98
	0%	Low	4.04	10.11	20.22
		High	9.17	22.92	45.84
		Average	6.13	15.33	30.66

For every \$1 spent on the Lower 1 Mile project, \$1.17 to \$2.83 will be returned in ecosystem services benefits after 100 years; and for every \$1 spent on Moon Valley, \$6.58 to \$14.92 in benefits will be returned.