

STANDARDIZING AND ENHANCING BENTHIC MACROINVERTEBRATE MONITORING TOOLS IN THE PUGET SOUND BASIN

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Benthic Macroinvertebrate Monitoring – Project Drivers

- Data widely used in Puget Sound Basin
- Inconsistent sampling and analytical methods – sample area, metric attributes etc.
- Lack of data management tools
- Challenge to evaluate data on regional basis
- Need for a regional freshwater indicator
- These issues spurred 2 key efforts




Early Collaboration: Regional Database Development

Puget Sound Stream Benthos

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Analyzing Stream Health

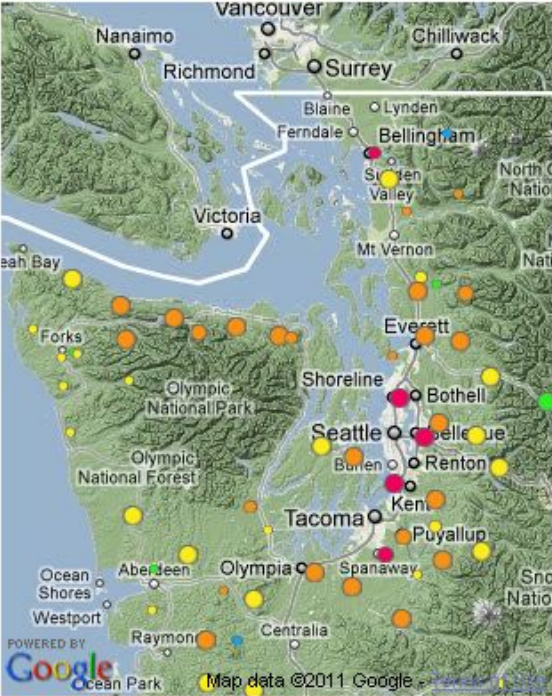
This site analyzes benthic macro-invertebrate community structure to determine the ecological health of streams. [Participating agencies](#) use this site to manage, analyze and share data from their ongoing stream monitoring programs.



Benthic macro-invertebrates, also known as stream bugs, are animals that can be seen with the naked eye, do not have backbones and live in the **stream benthos**—in or near the streambed. They include insects, crustaceans, worms, snails, clams, etc.

Benthic macroinvertebrates are monitored because they are good indicators of the biological health of stream systems and play a crucial role in the stream ecosystem.

Plotting Biotic Integrity



Click on biotic health markers for score details.

The BIBI Scoring System

We use the [Benthic Index of Biotic Integrity \(BIBI\)](#) scoring system to determine stream health. Since the BIBI is a standardized scoring system, it can be used to compare and rank the health of different streams.





BIBI has several variants, and we will support many of them over time. Currently, we are using Puget Sound Lowlands BIBI. This site allow you to filter the scores by a variety of parameters and then

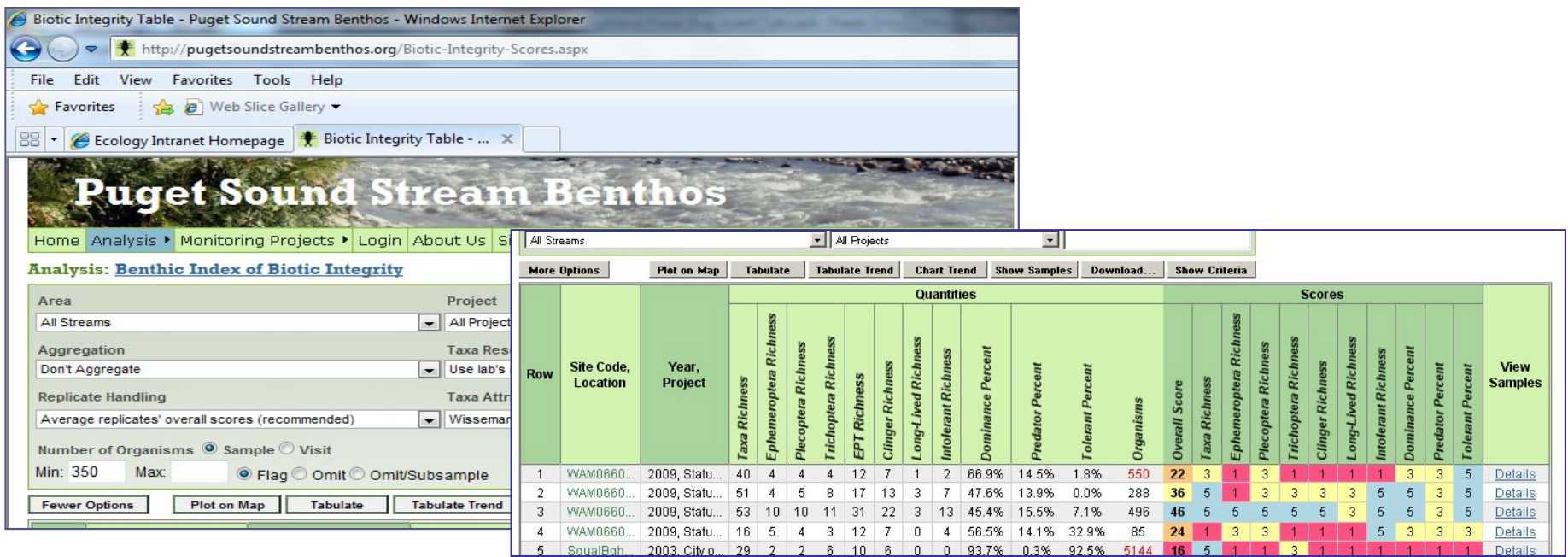
- [Plot the scores on maps](#)
- [Show the scores in tables](#)

In the future, we will chart trends. We will also calculate scores using other scoring systems.



PSSB Database Outcomes

-  Consistent & secure data storage
-  Enhanced analysis capabilities
-  Regional comparability
-  Successful collaboration



The screenshot shows a web browser window displaying the 'Biotic Integrity Table - Puget Sound Stream Benthos' website. The page title is 'Puget Sound Stream Benthos'. The navigation menu includes 'Home', 'Analysis', 'Monitoring Projects', 'Login', and 'About Us'. The main content area shows a table of benthic index data. The table has columns for 'Row', 'Site Code, Location', 'Year, Project', and various 'Quantities' and 'Scores'. The 'Quantities' section includes metrics like Taxa Richness, Ephemeroptera Richness, Plecoptera Richness, Trichoptera Richness, EPT Richness, Clinger Richness, Long-Lived Richness, Intolerant Richness, Dominance Percent, Predator Percent, and Tolerant Percent. The 'Scores' section includes Overall Score, Taxa Richness, Ephemeroptera Richness, Plecoptera Richness, Trichoptera Richness, Clinger Richness, Long-Lived Richness, Intolerant Richness, Dominance Percent, Predator Percent, and Tolerant Percent. A 'View Samples' column is also present. The table contains 5 rows of data.

Row	Site Code, Location	Year, Project	Quantities											Scores								View Samples				
			Taxa Richness	Ephemeroptera Richness	Plecoptera Richness	Trichoptera Richness	EPT Richness	Clinger Richness	Long-Lived Richness	Intolerant Richness	Dominance Percent	Predator Percent	Tolerant Percent	Organisms	Overall Score	Taxa Richness	Ephemeroptera Richness	Plecoptera Richness	Trichoptera Richness	Clinger Richness	Long-Lived Richness		Intolerant Richness	Dominance Percent	Predator Percent	Tolerant Percent
1	WAM0660...	2009, Statu...	40	4	4	4	12	7	1	2	66.9%	14.5%	1.8%	550	22	3	1	3	1	1	1	1	3	3	5	Details
2	WAM0660...	2009, Statu...	51	4	5	8	17	13	3	7	47.6%	13.9%	0.0%	288	36	5	1	3	3	3	3	5	5	3	5	Details
3	WAM0660...	2009, Statu...	53	10	10	11	31	22	3	13	45.4%	15.5%	7.1%	496	46	5	5	5	5	3	5	5	3	5	Details	
4	WAM0660...	2009, Statu...	16	5	4	3	12	7	0	4	56.5%	14.1%	32.9%	85	24	1	3	3	1	1	1	5	3	3	3	Details
5	SaualRah...	2003, Citv o...	29	2	2	6	10	6	0	0	93.7%	0.3%	92.5%	5144	16	5	1	1	3	1	1	1	1	1	1	Details

Recent Collaboration – EPA Grant

Enhance and Standardize Benthic Macroinvertebrate Monitoring and Analysis Tools

Overarching Goals of Grant

- Enhance analysis tools to improve sensitivity
- Create opportunities that support regional decision making and collaboration
- Facilitate data integration
- Develop a regional biomonitoring program and sensitive freshwater indicator


King County Department of Natural Resources and Parks Water and Land Resources Division

DEPARTMENT OF ECOLOGY State of Washington

EPA

Working together to measure the health of Puget Sound streams

Enhancement and Standardization of Benthic Macroinvertebrate Monitoring and Analysis Tools for the Puget Sound Region

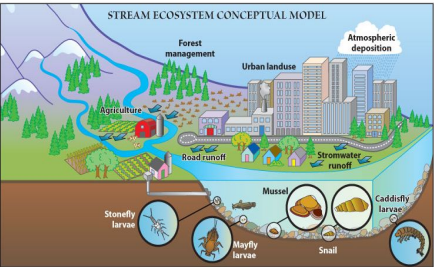


Grant details
Award amount: \$699,877
Timeline: January 2011 – December 2013
Sample collection: summer 2011 & 2012

Puget Sound stream invertebrates
Hundreds of unique species of benthic macroinvertebrates live among the rocks and cobbles of Puget Sound streams. Dozens of local jurisdictions, tribes and state and federal agencies collect macroinvertebrates to measure stream health and assess the impact of human disturbance. Macroinvertebrates are good indicators of a stream's biotic integrity because sensitive species decline as sedimentation, contaminant levels, and temperatures increase and as natural vegetation, habitat, and patterns and types of flow are altered.

Grant objectives

- In 2010 King County received a grant from EPA to begin to develop standardized benthic macroinvertebrate monitoring methods and enhance monitoring tools, regional collaboration, and partnerships throughout the Puget Sound area.
- Over time, different collection and analysis protocols have evolved within regional agencies to evaluate macroinvertebrate community data.
- This project matches two key goals of the Puget Sound Partnership to develop standardized monitoring tools and an ecosystem indicator for stream invertebrates.



Collaboration Goals

- 🐛 Bring together and engage regional partners
- 🐛 Establish consistent methods for data collection and analysis
- 🐛 Increase PSSB use to allow for regional evaluations
- 🐛 Improve decision making
- 🐛 Protect streams



Early Successes

- Significant enthusiasm and participation
- Increased interest in PSSB database use
 - Now a portal to Ecology's EIM database
 - Allows easy submission of biological data for Ecology's State Water Quality Assessment (303d list)



Integration with Policy

- ✈ BIBI adopted as Puget Sound Partnership's "Freshwater Biological Condition Dashboard Indicator"
- ✈ Better management decisions at local, regional, state level thanks to improved tools and data availability
- ✈ Benthic macroinvertebrate sampling required for 2013 NPDES Stormwater Permit



The background of the slide is a photograph of stream benthos. In the foreground, several dark, segmented insects, likely caddisfly larvae, are crawling on a light-colored, textured rock surface. The background is a shallow-focus view of a stream bed with many similar rocks and more benthic organisms. The overall lighting is natural, suggesting an outdoor stream environment.

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