Stream Habitat Metrics Integration Project

Data Drives Decisions

Monitoring of natural resources – water, forests, animal populations -- is critical to generate information needed for decision making. To serve this need, multiple state and federal agencies across the United States manage natural resource monitoring programs. However, it is typically difficult to integrate data to answer questions that transcend geopolitical and jurisdictional boundaries because monitoring activities are often specific to a program, agency, issue, or discipline.

How do we achieve data integration across agencies and multiple scales to ultimately use more information for decision-making?

One solution is to facilitate the reuse of similar monitoring data from individual monitoring programs by making their data findable, accessible, interoperable, and reusable (FAIR). Monitoring programs that use structured implementation, core indicators collected with a consistent methodology, statistically valid designs, and effective data management produce high-value data. When multiple large-scale monitoring programs collect similar measurements and create similar metrics, we have an opportunity to combine data from these programs and make information more accessible to resource managers. Combining data into an easy to access integrated data set with robust metadata will increase the use of an individual program's data, adding value to existing data and allowing us to answer previously unanswerable questions.

Across the United States, multiple programs measure stream habitat characteristics to inform a variety of management questions. Collectively, these data are a significant asset for natural resource management. Making these data FAIR will allow for reporting status and trends of stream habitat across jurisdictional boundaries, help inform future sampling efforts, and supplement existing data.

Project Goal: Make More Data Accessible and Easier to Use Now and in the Future

Four large-scale, long-term natural resource monitoring programs are working together to:

- Demonstrate integration of previously published metric-level stream habitat data
- Document a process and data exchange specifications to facilitate sharing metric level stream habitat data
- Provide robust metadata on protocols, methods, spatial and temporal designs, and method comparability between programs
- Connect monitoring sites to other tools such as NHD and StreamCat to enable linking to environmental context and other relevant data
- Allow data users to download an integrated data set based on their spatial, temporal and/or environmental criteria via online tools and Application Programming Interface (API)

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For more information, see https://www.pnamp.org/project/habitat-metric-data-integration

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Documentation is Essential

Combining data from multiple programs requires knowledge of how the data are collected and how the integrated data set is created. To document and describe, we use these resources:

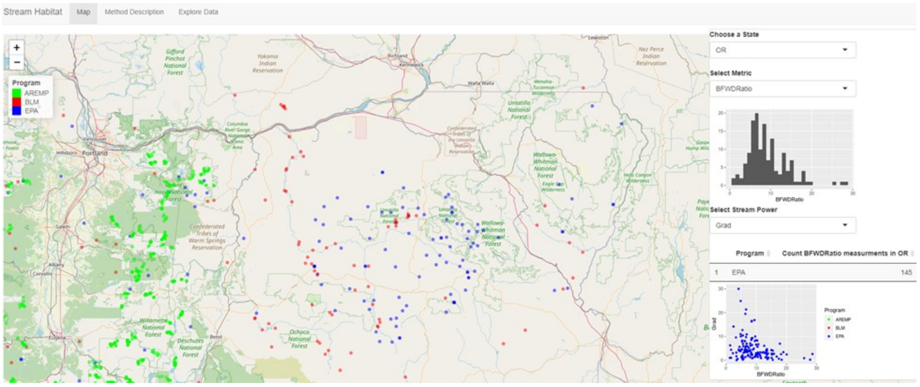
ScienceBase, a USGS Trusted Digital Repository, is a collaborative scientific data and information management platform designed to help science teams and data practitioners centralize their data and information resources. We use ScienceBase to document metadata about each program's data set and the new integrated data set in a machine-readable way, so it is accessible via API for use by anyone.

MonitoringResources.org an online, publicly accessible suite of information and tools for natural resource monitoring programs, focusing on documentation of data collection and analysis methods. In this project, we use *MonitoringResources.org* to document each program's methodologies.

GitHub a web-based repository hosting service that specializes in version control. Team members can work on files and merge their changes with the project's main branch, with these changes tracked and recorded. We use GitHub to host the data exchange specifications and source code to integrate the data sets and track the documentation. Once completed, anyone can download and use the data exchange specifications and code.

New Tools to Discover and Access Integrated Data Sets

Monitoring programs spend significant effort and money to collect and process data. Making these data accessible beyond the individual program can provide benefit to many. Tools resulting from this project include:



- A controlled vocabulary for the habitat metrics shared
- A crosswalk of the four participating monitoring programs' source data sets to the controlled vocabulary
- Machine-readable robust metadata documentation for each data set and the metric collection process
- A data set integrating data from three of the participating monitoring programs
- Data exchange specifications that define rules for sharing stream habitat data
- An online tool to download data from the integrated data set in an analysis-ready format

Partnership is Key to Success

This project would not be possible without the participation of these programs. We look forward to including additional partners and incorporating additional data in the future. Current partners:

- BLM Assessment, Inventory, and Monitoring Strategy (AIM)
- EPA National Aquatic Resources Survey (NARS)
- USFS/BLM Aquatic and Riparian Effectiveness Monitoring Program (AREMP)
- USFS Pacfish/Infish Biological Opinion Monitoring Program (PIBO MP)
- U.S. Geological Survey/Core Science Systems Mission Area

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