

### Assessing the Ecological Health of Reclamation's Reservoirs

*Using physical, chemical, and biological parameters to assess general ecological conditions for Reclamation reservoirs within a region*

#### Bottom Line

This research project developed reservoir health assessments to help characterize the current conditions for reservoirs in Reclamation's Snake River area, Idaho, that support bull trout.

#### Better, Faster, Cheaper

Developing and applying ecological health assessments for reservoirs will help indicate conditions that can cause environmental concerns if left unnoticed. A consistent set of indicators, data collection, and assessments can provide comparable rates by time and site, as well as ecological health status trends. Without this consistency, project information and data collection cannot provide a true picture of trends over a long period of time within a region.

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#### Problem

Reservoirs are complex ecosystems with fish, birds, algae, and insects coexisting in a bewildering array of influences from water quality parameters (such as water temperature, dissolved oxygen, and components) and water quantity (such as changes in levels). Understanding the overall ecological health of Reclamation's reservoirs and trends over time is vital to efficient and environmentally sound management. Using "spot checks" to evaluate ecological health of a reservoir may miss seasonal trends and provide an inconsistent picture of overall health. Data needed to establish an ecological health assessment trend may be available by using datasets already being managed by different groups.

Reclamation performs many investigations using physiochemical parameters (e.g., water temperature, dissolved oxygen, and water quality) or biological parameters (e.g., chlorophyll *a*, macroinvertebrates, and fish). But understanding and comparing these parameters poses major challenges:

- Temporal and spatial characteristics of the hydrologic and thermal regimes vary. Assessments are not conducted at similar times or in similar locations. Some have been conducted in short- and long-term periods and others periodically at established monitoring intervals.
- Parameters are not consistent between studies. Most investigations have described measured or mean values on physiochemical parameters and lists of fauna species with individual numbers and catch rate statistics in the results. However, parameters vary depending on the natural conditions at the time of sampling (e.g., fluctuation of precipitation, inflow, water level, and temperature with climate change).
- Data are put on the shelf and not tracked. These data have been mostly used and stored separately when projects were completed. Thus, assessments may not consider or recognize long-term changes.

Therefore, it is difficult to compare individual data points and parameters and assess a general ecological condition of reservoirs.

In 1990, the Tennessee Valley Authority (TVA) began a systematic monitoring program with 12 reservoirs to:

- Provide information on reservoir "health"
- Determine if conditions are changing
- Target detail assessment studies
- Report results

The monitoring program currently includes 69 sites on 31 reservoirs throughout the Tennessee River Valley, and each site is sampled every other year unless a substantial change in the ecological health occurs during a 2-year cycle. Reclamation could use a similar program.



*Palisades Dam, Idaho*

## Solution

To help assess, rate, and compare ecological condition of Reclamation's reservoirs, this Reclamation Science and Technology Program research project first examined the TVA's monitoring program and adapted these ideas for the Snake River Area Office in Reclamation's Pacific Northwest Region, including:

- A standardized list of parameters (subset) from a larger list of commonly sampled parameters that can be used for an Ecological Health Assessment. Variables include: physical (water temperature), chemical (dissolved oxygen and sediment quality), and biological (chlorophyll *a*, benthic macroinvertebrates, and fish communities).
- A "theoretical" web-based database that can be used to help managers and analysts apply an Ecological Health Assessment for a reservoir. This database can be used to describe baseline conditions for future reporting and, coupled with literature reviews, to design more specific studies when necessary. Data were used from the Laboratory Information Management System database in Reclamation's Pacific Northwest Regional Office Water Laboratory, which stores water quality data from both fisheries and water quality monitoring projects. It would be possible to incorporate data from sources outside Reclamation.

## Future Plans

The conceptual idea of the work helps increase the awareness of consistency in data collection of certain parameters during routine work for the Snake River Endangered Species Act group. Now Reclamation has a foundation for a database to collect data from across disciplines. These data will be very important sources for determining long-term trends and can provide a foundation for operational decisions.

Reclamation is hopeful that other offices and/or programs will join in the collaboration of future efforts. This research warrants further applications, such as developing programs for other watersheds and making data available for researchers and analysts.

***"Developing a web-based tool for tracking the ecological health of a reservoir could be a valuable tool for the general characterization of aquatic ecosystems and making comparisons among Reclamation's reservoirs."***

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## More information

[www.usbr.gov/research/projects/detail.cfm?id=5163](http://www.usbr.gov/research/projects/detail.cfm?id=5163)

