neon | **National Ecological Observatory Network**

AQUATIC MEASUREMENTS AND OBSERVATIONS

LET US HELP YOU LOOK BENEATH THE SURFACE.

Understanding the health of streams, rivers and lakes is critical to understanding the health of ecosystems as a whole. The National Ecological Observatory Network (NEON) provides hundreds of data points from across the U.S. to help researchers detect and quantify how aquatic systems are changing over time due to climate change, human activity, invasive species and other stressors.

NEON, operated by Battelle, is a long-term continental-scale research project providing freely available data. Observational and sensor-based data are collected throughout the year at 34 aquatic field sites featuring 24 streams, three large rivers and seven lakes. Aquatic sites are strategically located to represent ecological variability across the continent, including various geomorphologic and hydrologic regimes and land use types. An additional 47 field sites are located in terrestrial ecosystems, many of which are collocated with these aquatic sites.

OBSERVATIONAL SAMPLING

NEON's aquatic observations characterize channel and lake morphology, organism abundance and diversity, seasonal climatic and hydrologic changes, and riparian phenology using a standardized, consistent sampling strategy across field sites, time and focal species. Field operations crews collect observational data at regular intervals to complement data collected by automated in situ aquatic sensors. To capture a range of ecosystem processes and detect ecosystem-level change, sampling strategies are based on temperature, water flow and peak greenness.
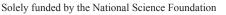
AUTOMATED INSTRUMENT MEASUREMENTS

NEON uses automated instruments to characterize aquatic systems and conditions such as hydrologic processes, surface water quality and groundwater quality, as well as local atmospheric conditions. At each aquatic site, a variety of aquatic sensor stations are configured and installed using standardized methods in streams, lakes and rivers. These automated sensors continuously collect aquatic data ranging from water quality measurements to localized atmospheric measurements.

WHAT WE MEASURE

NEON collects more than 200 types of data at each aquatic site, including automated physical, chemical and biological measurements in several aquatic area types.

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SAMPLING TYPE	SYSTEM	DATA TYPE	WADEABLE STREAMS (24)	NON-WADEABLE STREAMS (3)	LAKES (7)
Sensor sets*	AIS	chemical/physical	top and bottom of reach	1 on buoy, 1 near bank	1 on buoy, 1 at inlet, 1 at outlet
Meteorological station	AIS	physical	riparian	riparian	riparian/buoy
Groundwater wells	AIS	chemical/physical	up to 8	up to 8	up to 8
Reaeration sampling	AOS	physical	Y	N	N
Water chemistry, isotopes, dissolved gas	AOS	chemical	Y	Y	Y
Zooplankton, phytoplankton	AOS	biological	N	N	Y
Secchi depth profile	AOS	physical	N	Y	Y
Bathymetric mapping	AOS	physical	N	Y	Y
Morphologic mapping	AOS	physical	Y	N	N
Discharge	AOS	physical	Y	TBD	N
Fish sampling (at 31 of 34 sites)	AOS	biological	Y	N	Y
Riparian assessment	AOS	biological	20 stations	10 stations	10 stations
Sediment chemistry	AOS	chemical	Y	Y	Y
Macroinvertebrates, plants, algae, microbes	AOS	biological	Y	Y	Y

*Sensors vary by location

WHY IT MATTERS

Our observational data can be used to derive key ecological indicators, including:

- In-stream, in-lake and in-river biomass.
- Aquatic microbial abundance and diversity.
- Aquatic organismal abundance and diversity.
- Water and sediment chemistry.
- Ecosystem metabolism (gross primary productivity and ecosystem respiration).
- Stream nutrient and chemical fluxes.

Instrument data from NEON's aquatic field sites support derivation of high-level data products, including:

- Stream metabolism.
- Lake metabolism.

AN INTEGRATED APPROACH TO SAMPLING DESIGN

NEON's aquatic instrument and observational data, combined with other NEON ecological data, provide an unprecedented opportunity to study ecosystem-level change over time. Where logistically possible, NEON collocates aquatic sites with terrestrial sites to support understanding of linkages across atmospheric, terrestrial and aquatic ecosystems.

About the NEON project
The NEON project is a continental-scale ecological network, sponsored by the National Science Foundation and operated by Battelle, that gathers and synthesizes data on the impacts of climate change, land use change and invasive species on natural resources and biodiversity. The network of ecological sites collects high-quality data from 81 field sites (47 terrestrial and 34 aquatic) across the U.S. (including Alaska, Hawaii and Puerto Rico). Data collection methods are standardized across sites and include in situ instrument measurements, field sampling and airborne remote sensing. Field sites are strategically selected to represent different regions of vegetation, landforms, climate and ecosystem performance. Access to the NEON databases and resources are freely available to enable users to tackle scientific questions at scales not accessible to previous generations of scientists.

About Battelle
Every day, the people of Battelle apply science and technology to solving what matters most. At major technology centers and national laboratories around the world, Battelle conducts research and development, designs and manufactures products, and delivers critical services for government and commercial customers. Headquartered in Columbus, Ohio since its founding in 1929, Battelle serves the national security, health and life sciences, and energy and environmental industries.
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