ENVIRONMENTAL INFORMATICS

GET MORE OUT OF YOUR DATA.

New technologies and sampling methods have made it easier than ever to gather environmental data. But how do you manage it all? And how do you cut through the noise to draw meaningful conclusions?

Battelle can help. Our Environmental Informatics team combines extensive environmental science experience with world-class data analytics to convert environmental data into usable information, reliable predictions and defensible decisions. We can help you:

- Design and implement environmental data systems that are effective, reliable and flexible
- Improve and preserve data quality
- Standardize data collected from disparate sources for comparability and repeatability
- Find meaningful trends and connections hidden in large volumes of environmental data
- Use data more effectively for risk analysis and decision making

OPTIMIZING ENVIRONMENTAL DATA SYSTEMS

The volume, velocity and variety (three "Vs") of environmental data collection can put tremendous stress on data systems. At the same time, the pace of decision making and increasingly sophisticated questions from researchers, lawyers and other stakeholders demand systems that accelerate data throughput and enable integration of varied lines of evidence. We can help you design—or redesign—your environmental data systems to improve IT stability, preserve data integrity and make your data more accessible and usable for all of your stakeholders.

- **Environmental Data System Design:** Our data systems are built around your lines of evidence, data quality objectives, data collection methods, interoperability needs, security requirements and budget.
- **Decision Support and Conceptual Site Modeling:** Battelle ensures that your data work more effectively in environmental research, restoration or policy decisions because our system designs are framed that way.
- **Workflow-Based Requirements Analyses & Acceptability Testing:** We use workflow-based requirements analyses to design systems for complex environmental investigations.
- **Legacy System Migrations or Improvement via Distributed Services:** Battelle helps clients retain the value of legacy systems while also exploiting newer technologies, approaches or efficiencies.

IMPROVING AND PRESERVING DATA QUALITY

At Battelle, we combine subject matter expertise in environmental sciences and information technology to design practical data quality systems and methods tailored to the realities of environmental data collection. Our data scientists will work with you to develop data quality systems and methods that improve the accuracy, precision, completeness, replicability and representativeness of your data. We can help you optimize your data collection and management systems and standardize data collected from disparate sources so that your data products are highly accurate, comparable and repeatable.

- **Quality Management Plans:** Our quality management plans address program quality and organizational leadership in concert. We'll help you design a quality system that holds up from the field to the lab to the courtroom.
- **Lifecycle Management of Sample Custody and Lab Providers:** Our barcode-based sample management systems let you track environmental samples every step of the way, from field collection plans to final recording of laboratory results. Our electronic data deliverable (EDD) protocols flexibly handle diverse formats used by chemistry Laboratory Information Management Systems (LIMS).
- **Cyberinfrastructure with Embedded Quality Control (QC):** Battelle addresses data quality beginning at the moment of capture through real-time QC with synchronized lexicon and place-specific constraints so that producers can solve issues immediately.

REVEALING DEFENSIBLE INSIGHTS FROM ENVIRONMENTAL DATA

Making effective remediation, policy or regulatory decisions requires skills beyond "number crunching." You need to be able to use data to answer complicated environmental questions, draw defensible conclusions and communicate complex information to all stakeholders. Battelle uses state-of-the-art analytical methods informed by a deep understanding of the science behind the data you are analyzing. That means you can have confidence that the results will be usable for making effective data-driven decisions for your environmental programs.

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- **Data Analytics:** Because decision models are the foundation of our system designs, our data analytics tools can be used to readily convert environmental data into relevant information, intuitive visualizations, reliable prediction and defensible decisions. Our flexible, iterative analytical models enable sensitivity analyses, human health risk projections and decision tradeoffs.

- **Data Visualization:** Our data visualization tools can be used to turn complex environmental data into easily digestible information in the form of charts, graphs, maps or animations. Our visualization tools can help you quickly see patterns and trends in your environmental data and communicate complex information to non-technical stakeholders.

- **Semantic Search:** Battelle applies advanced analytical methods—including machine learning, natural language processing and ontology development—to help researchers find fast answers to complex questions. Using our ontology-based approach, our semantic programs are able to quickly return relevant and meaningful results, vastly reducing the time required to analyze large datasets or find relevant information from large corpora or scientific literature.

OUR EXPERIENCE

Taming the Tide of Data from the Deepwater Horizon Oil Spill

The 2010 Deepwater Horizon Oil Spill Response generated hundreds of thousands of environmental data points over the course of several years. The data were generated by Battelle researchers and a host of other programs, agencies, laboratories and organizations, each using their own observation and measurement methods and data recording conventions. BP asked Battelle to collect all of the data generated from the Response into a single database system: the Health, Safety and Environment Data Management System (HSE-DMS). The new database collected all Response data—including analytical chemistry data from air, water, sediment, and tissue; hydrocarbon fingerprint data; toxicity data; shoreline cleanup data; air and water sensor data; industrial hygiene data; cleanup waste data; and fish and shellfish testing data—into one system for storage, query and analysis. Battelle designed, built and populated the database and data management system, standardized the data and developed a quality management system for BP and its contractors to support consistent and rigorous verification of reported data. The HSE-DMS enabled BP, its contractors and others involved in the Response program to turn vast quantities of environmental data from disparate sources into meaningful conclusions and effective environmental restoration decisions.

Tracking Environmental Public Health

The Centers for Disease Control and Prevention (CDC) created the Environmental Public Health Tracking program in 2002 to collect environmental and public health data from multiple information systems in one place so that impacts could be better analyzed and tracked over time. They needed new informatics tools to manage, integrate and standardize these data sources and make the data usable for researchers and public health leaders. They came to Battelle in 2008 for help in managing, implementing and improving the National Environmental Public Health Tracking Network, an online portal for environmental and public health data reporting, collection and dissemination. The Tracking Network currently integrates more than 40 climate change measures and 40 air quality measures. The CDC and other public health agencies rely on Tracking Network data to identify environmental stressors for regions and communities, monitor trends in environmental public health concerns over time, and develop outreach materials for researchers and the public.

Managing Data for the National Ecological Observatory Network (NEON)

NEON is a network of 81 field sites across the continental United States that gather sensor and field data from a diverse range of terrestrial and non-marine aquatic ecosystems. These observatory sites are already generating tremendous volumes of data, which will continue to grow as the remaining observatories come online and additional environmental data points are added. The National Science Foundation (NSF) needed an environmental informatics solution to collect, store and manage the observatory data and enable researchers to perform complex queries and data analysis. Battelle built a cyberinfrastructure to manage all of the data collected from the NEON observatories and make it accessible for researchers. The cyberinfrastructure and NEON data portal allow unprecedented visibility into ecological data at a continental scale.