

Environmental Data

from the Oak Ridge Reservation

Over the past 60 years much valuable environmental data has been compiled from the Department of Energy's (DOE's) Oak Ridge Reservation (ORR). This accumulated information ranges from ecological measurements related to various research projects to data derived from satellite and ground-based observations.

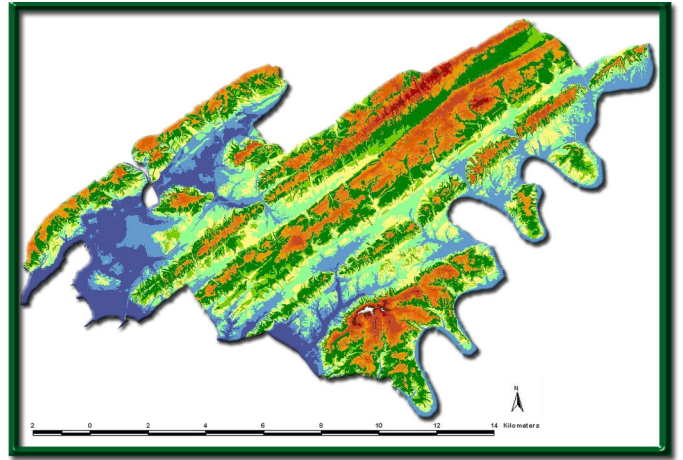
Outdoor Research Laboratory

With almost 34,000 acres, the ORR is one of the few intact landscapes remaining in the eastern Tennessee region. Acquired in 1942 as part of the Manhattan Project, the ORR has become an outstanding research site that is used by Oak Ridge National Laboratory (ORNL) and many other research and educational institutions. Approximately 20,000 acres of the ORR have been designated as a DOE National Environmental Research Park. Scientists use this area as an outdoor laboratory to investigate environmental issues and to conduct ecosystem research. A rich library of geographic data about the ORR has been accumulated that includes the following topics:

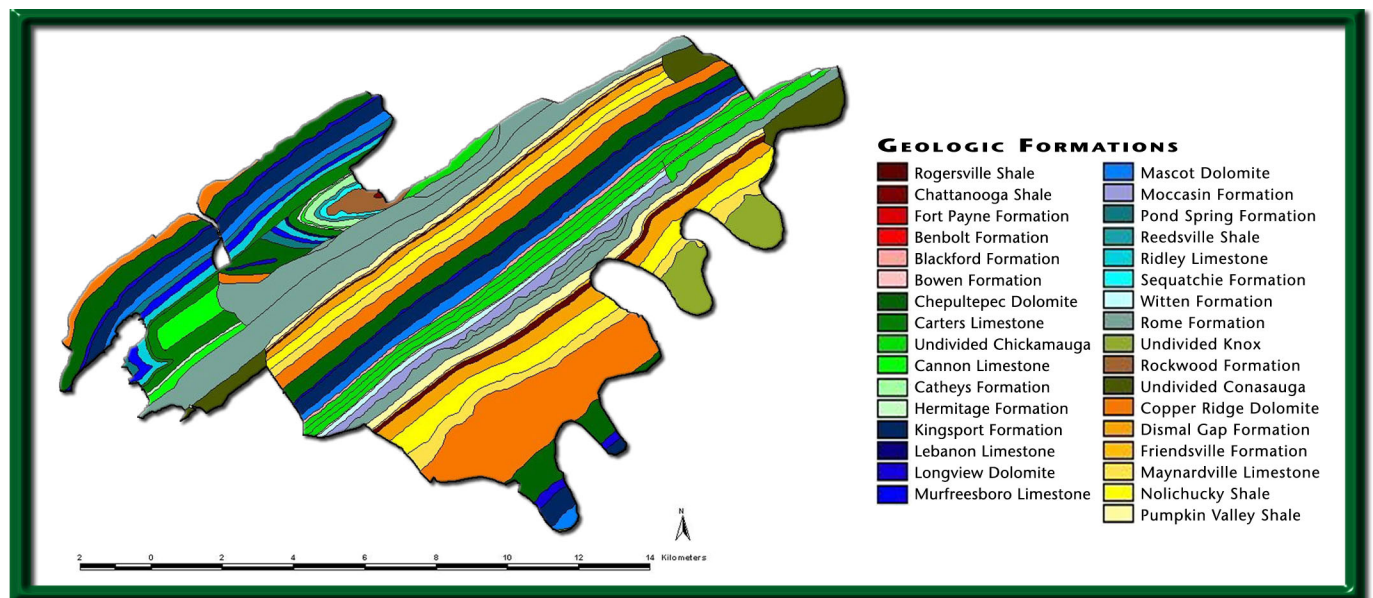
- wind, temperature, precipitation, and water vapor;
- atmospheric deposition and air quality;
- aquatic habitats and surface water (daily stream flow, stream chemistry);
- terrestrial habitats and vegetation;
- infrastructure;
- land use, land cover, soils, and topography; and
- geologic formations.

Geographic Information System

Data collected from the ORR and its major research facilities are accessible through the Environmental Data for the Oak Ridge Area (EDORA) Mercury data system, which is updated frequently. This amassed data can be used to solve complex planning and management problems. Much of the ORR data has been incorporated into a



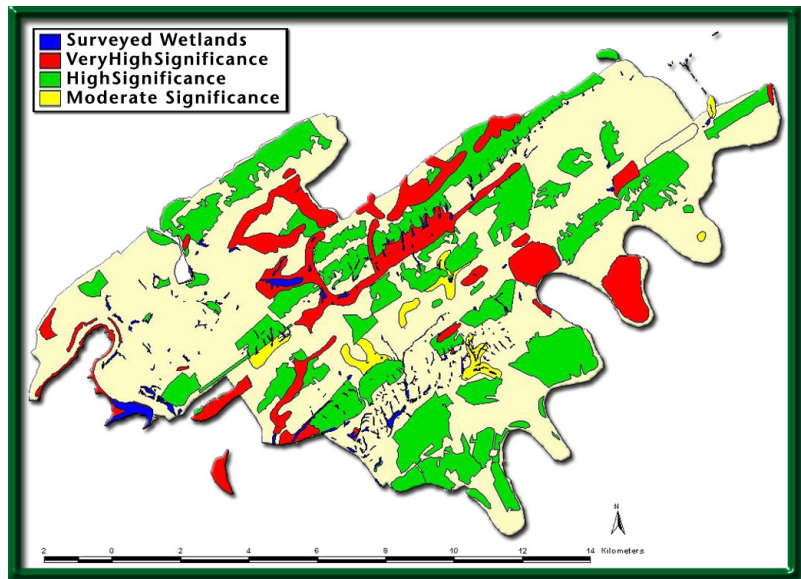
With distortions removed, photographs taken from a low-flying airplane can accurately represent real-life conditions. This map is based on air photos of the ORR taken in 1993 and 1998. Ridge tops are shown in reds and oranges; low areas are in blues.



The ORR's exposed bedrock is composed entirely of sedimentary rocks that range in age from the Early Cambrian Era to the Early Mississippian Era. This map was created by walking in straight lines across the ORR and recording the geological features encountered.

geographic information system (GIS) that covers the ORR and surrounding counties—Anderson, Blount, Loudon, Knox, Morgan, and Roane.

A GIS combines and analyzes layers of data taken from many sources and maps the results. By pointing at a location, object, or area on a computer screen, information about it can be retrieved from the GIS. By overlaying or superimposing two or more map layers to produce a new map, GIS analysis can identify locations that have particular attributes or the attributes of a specified location. ORNL's Environmental Sciences Division maintains a GIS laboratory to compute, process, and analyze geospatial data. It can convert map lines and points to digital information; use global positioning system (GPS) information to compute the latitude, longitude, and elevation of a location; make spatial measurements; and analyze digital photographs. This laboratory is a tool for environmental research and analysis and land management at a landscape and regional level.



The ORR is a refuge for rare and endangered species and offers a unique opportunity to study landscape ecology and land management practices. Using existing data and field observations, The Nature Conservancy identified the regions of biological significance on the ORR depicted here.

Data Sources

- Many data sets from the ORR have been collected as part of the *Bioenergy and Carbon Sequestration Initiative*. “Carbon sequestration” refers to the long-term storage of carbon in terrestrial plants, in the ground, or in the oceans to reduce or delay the buildup of carbon dioxide—the principal greenhouse gas added to the air from human activities. This initiative aims to promote and facilitate research on the ORR and elsewhere on maintaining or enhancing natural processes or developing novel techniques to dispose of carbon.
- The *Walker Branch Watershed* has two intensively instrumented drainage areas. A number of experiments (e.g., the Throughfall-Displacement Experiment) and monitoring programs (e.g., Continuous Monitoring of Stand-level Carbon and Water Flux) at Walker Branch provide environmental information. The data can be validated by comparing information collected from satellites to data collected in the field and from aircraft.
- The *Free-Air Carbon Dioxide Enrichment (FACE)* experimental site is used to measure the responses of an intact forest ecosystem to projected future atmospheric concentrations of carbon dioxide.
- Data are gathered as part of the *Biological Monitoring and Abatement Program (BMAP)*. BMAP staff monitor the ecological health of streams that receive discharges from DOE facilities on the ORR.
- The *Natural and Accelerated Bioremediation Research (NABIR)* program’s Field Research Center (FRC) contains an area used for conducting experiments on a plume of contaminated groundwater, a background area that provides for comparison studies in an uncontaminated area, and ancillary structures.
- The *National Oceanic and Atmospheric Administration (NOAA)* maintains a meteorological tower at the Walker Branch Watershed on the ORR and is constructing a second tower on Chestnut Ridge. They also collect climate data at other weather stations on the ORR.



A student determines tree diameter as part of a project testing the ability of an experimental airborne radar to remotely measure tree biomass. (Photo by Liz Williams.)

For more detailed information on environmental data related to the ORR, contact Pat Parr, the ORNL Area Manager, at 865-576-8123; parrpd@ornl.gov; or check the Research Park web site at www.esd.ornl.gov/facilities/nerp.