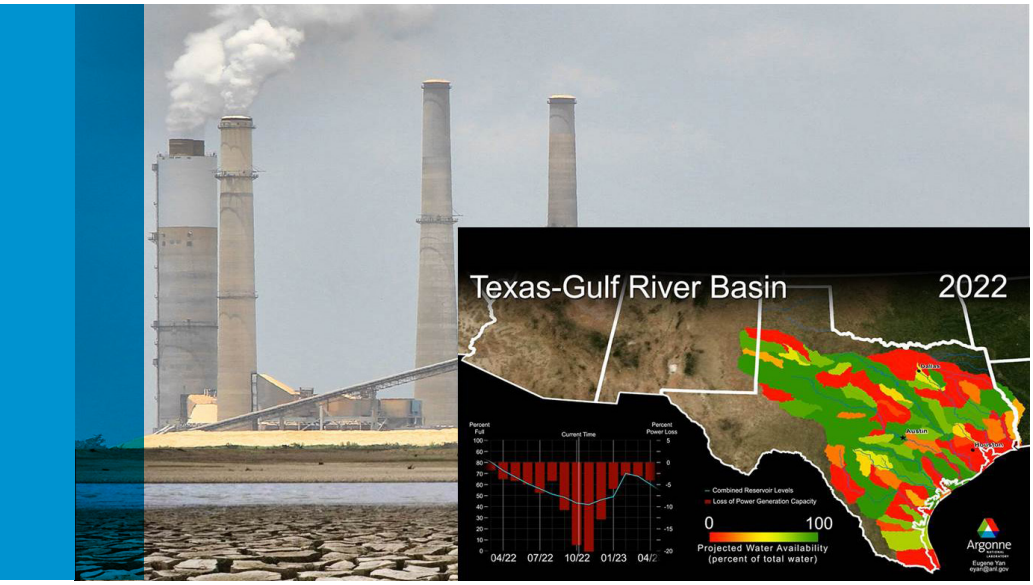
Argonne NATIONAL LABORATORY

ENVIRONMENTAL SCIENCE DIVISION

Argonne's world-renowned scientists and engineers take on the Nation's big environmental challenges.



Impacts of drought on power generation for Texas-Gulf River Basin

The Environmental Science Division (EVS) conducts basic and applied research and assessments, seeking to better understand how both natural and human-managed environmental systems function and how their components respond to various disturbances.

DEPARTMENTS

Climate & Atmospheric Science

Combines measurement and modeling capabilities to analyze atmospheric processes of interest to climate research. We use surface meteorology and remote sensing, as well as our modeling and analysis capabilities, to support U.S. Department of Energy (DOE) programs.

Hydrological Science

Analyzes surface water and groundwater and addresses a host of issues related to water use and quality. We focus on key environmental issues such as cleaning contaminated water, the relationship between water and energy production, how water resources relate to climate change, water quality, and creating models of surface water.

Ecological Science & Environmental Risk

Researches how ecological resources such as plant and animal species, communities, and habitats—as well as ecological processes like carbon sequestration—may be affected by human activities ranging from energy development to changes in land use, introductions of invasive species, and accidental chemical and radiological releases. We also identify ways to measure and mitigate the potential effects human activities may have on these resources.

Energy & Environmental Systems

Studies the way technology affects the environment and the roles of petroleum and renewable resources in the national energy portfolio. We assess sustainable resource management, analyze environmental and energy policy, ensure environmental compliance, remediate damaged or contaminated environments, conduct risk assessments, assess the environmental impacts of radiological and military munitions, and support waste management. We also learn how critical parts of the Nation's infrastructure are vulnerable to natural and human threats, and how we can protect them from these threats.

Natural & Sociocultural Systems

Evaluates social and cultural issues related to a wide range of energy projects. Scientists in this multidisciplinary group conduct activities relevant to cultural resource management of archaeological sites and historic structures; assess cultural landscape values and risks; identify impacts and potential ways to mitigate impacts on cultural and paleontological resources, tribal concerns, socioeconomics, and environmental justice; and evaluate ecosystem services.

Environmental Software & Data Management

Combines expert web software development and an extensive history in geospatial science to create user-focused tools for advanced analysis and modeling. We design and develop web-based systems for advanced geospatial processing, environmental modeling, and public involvement; analyze geospatial data; and create hardware and software systems for environmental monitoring and analysis. We created the Energy Zones Mapping Tool to help state utility commissions, legislators, energy utilities, and researchers plan the "smart grid" of the future—a responsive, intelligent electrical distribution grid that uses

digital technology to improve the performance and efficiency of the electric delivery system.

PROGRAMS

Atmospheric Radiation Measurement (ARM) Field Program

Manages operations for the DOE Atmospheric Radiation Measurement Program (ARM; www.arm.gov) Southern Great Plains facility in Oklahoma—the world's largest, most comprehensive scientific user facility providing atmospheric observations for climate research. The ARM facility includes three fixed facilities, three mobile facilities, and an aerial facility, which are strategically located to provide data from around the world. The data gathered support studies of the effects of aerosols, precipitation, surface flux, and clouds on the global climate.

Rivers & Hydropower

Addresses the effects of hydropower systems on rivers. We develop solutions that support the sustainability of downstream resources while minimizing effects on hydropower production. We have worked with federal agencies and other researchers to develop a long-term experimental management plan for Glen Canyon Dam on the Colorado River, support endangered species recovery in the Green River downstream of Flaming Gorge Dam, develop methods to maximize environmental benefits of hydropower while minimizing cost of power generation, and analyze the risk of invasive aquatic species being accidentally transferred between the Mississippi River Basin and the Great Lakes.

Land Resources & Energy Policy

Supports various land management agencies in impact assessment, renewable resource development, and sustainability planning. We focus on regional planning—particularly in the context of mitigation, long-term monitoring, and adaptive management—and promoting stakeholder involvement in the creation and upholding of environmental policies. Recent work has included assessments for geothermal, solar, wind, and energy corridor development incorporating regional data on ecological and cultural resources.

Applied Geoscience & Environmental Restoration

Evaluates sites in the Midwest with contaminated soil and groundwater resulting from past agricultural practices. We engage stakeholders while employing advanced methods to determine the distribution of contamination in soils and groundwater, establish the need for remediation, assess innovative technological solutions, and investigate and mitigate indoor air contamination. We assess current remedial technologies, such as phytoremediation (treatment with trees/plants), constructed wetlands, and treatments that use subsurface bacterial populations to clean and restore contaminated soil and groundwater. In the near future, we will install a shallow horizontal well to treat and remove contaminated groundwater at a rural community in Kansas. The remediated groundwater will be used to irrigate local school athletic fields.

Risk & Legacy Management

Provides DOE and other agencies technical plans for safely approaching nuclear waste disposal and managing sites that need long-term care, and assesses the risks involved in doing so. We use leading-edge risk analysis and other system development in our risk and legacy management projects. We have evaluated the potential environmental impacts associated with constructing and operating new facilities, or using an existing facility, to dispose of low-level radioactive waste; supported the U.S. Nuclear Regulatory Commission (NRC) in evaluating applications for the licensing of nuclear power plants and fuel cycle facilities; and created RESRAD (RESidual RADioactivity), a family of computer codes regulators use to evaluate levels of radioactive contamination.

Nuclear Regulatory Programs Management

Performs research to support the regulation of radioactive materials, primarily for the NRC and associated licensing activities. We model radioactive material release, environmental transport, and human health impacts to evaluate the environmental impacts of the different stages of the nuclear fuel cycle. We also evaluate the degradation of metals and concrete over time in nuclear reactors.

Systems Ecology

Conducts research to address the ecological sustainability and vulnerability of natural and managed ecosystems. We quantify the impacts of perturbations and management practices on ecosystem services; quantify the amount of carbon in soils in northern regions; assess the potential for carbon to be released to the atmosphere due to climate change; determine whole ecosystem carbon fluxes and the mechanisms that contribute to organic matter stabilization and storage in soils of natural, agricultural, and restored systems; and investigate the impacts plant traits, plant productivity, microbial diversity, and soil properties have on climate and the sustainability of crops used to produce bioenergy.

CENTER FOR GEOSPATIAL ANALYSIS

This center supports collaboration among the various branches of EVS to develop and apply new techniques to model geospatial systems and manage the vast amounts of data produced by and for these models.

CONTACT

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