Using Spatial Analysis to solve our Complex Bioenergy Challenges

The Biomass Program is supporting advanced analyses using Geographic Information Systems (GIS) to evaluate yields and costs of biomass production, to plan efficient infrastructure development, and to connect biofuels to end users.

National Vision of a Sustainable Future for Bioenergy

The U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy's Biomass Program is helping transform the nation's renewable and abundant biomass resources into cost-competitive, high-performance energy solutions. The Biomass Program envisions a viable, sustainable, domestic bioenergy industry that:

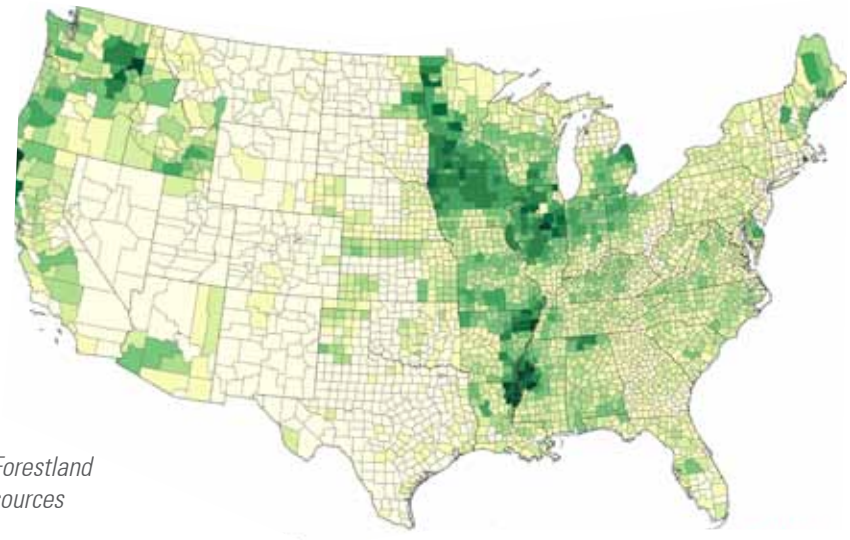
- Produces renewable biofuels, bioproducts, and biopower
- Enhances U.S. energy security
- Reduces our dependence on oil
- Provides environmental benefits, including reduced green house gas emissions
- Creates economic opportunities across the nation.

Achieving the Vision: Leveraging Advanced GIS Capabilities

GIS-based analysis provides crucial support in making informed decisions and will be an important component in working towards for a sustainable bioenergy future. Using GIS allows researchers to understand complex problems by visualizing data, extracting trends, optimizing routes, and creating interactive maps and charts. To speed the development and deployment of advanced bioenergy solutions, the Biomass Program is directing the combined capabilities and perspectives of the national labs, universities, industry, and environmental groups in a diverse portfolio of bioenergy GIS research projects.

What is a Geographic Information System?

Geographic Information Systems (GIS) are collections of data where every data point has an explicit spatial location. Essentially, a GIS can be thought of as a digital model of the physical world where every data point corresponds to a place. Modern GIS are a suite of hardware, software, and electronic databases built from a variety of data sources that can range from remotely sensed measurements to waypoints collected in the field with handheld devices. Geographic information science is an advanced field that utilizes GIS to enable researchers to analyze, visualize, and synthesize vast amounts of information to help understand real word interactions and support decision making processes. GIS is a critical component in planning and deploying renewable energy technologies, including biomass production capabilities.



Cropland & Forestland Biomass Resources ORNL, 2009)

GIS Research Portfolio:

GIS projects receiving support from the Biomass Program range from analyzing algal growth potential to siting integrated biorefineries and understanding international land use change. Current projects include:

National Bioenergy Knowledge Discovery Framework

An initiative led by Oak Ridge National Laboratory that uses GIS to analyze and visualize data. The resulting product, accessible to a range of users and platforms, will promote the efficient planning, development, and management of sustainable, domestic bioenergy infrastructure, production, and use.

Sun Grant Initiative Feedstock Partnerships GIS Resource Assessment

An integrated effort to collect energy crop field trial data from the Regional Feedstock Partnership program and develop regional GIS-based tools. These tools will advance understanding of regional differences in crop productivity and the nutrient and water requirements for growing dedicated energy crops.

Feedstock Supply Logistics Sustainability Analysis

An Idaho National Laboratory effort to couple GIS-based sustainable crop resource analyses with the IBSAL-SD feedstock supply system modeling toolkit. The integrated framework will provide accurate and spatially explicit supply system operation modeling, as well as assessing the role and impact of emerging markets through the Uniform-Format design concepts.

Microalgae Biofuel Potential

A systematic, GIS-based national assessment of microalgae production potential throughout the United States led by the Pacific Northwest National Laboratory. The assessment includes evaluating environmental constraints and algal growth rates with climate, water, land and infrastructure data.

Global Biodiversity and Ecosystem Services Conservation

An initiative led by Conservation International to integrate assessments of biofuel crop siting with high priority conservation goals using GIS. The resulting product will identify high-value conservation areas where biofuel crop development should be avoided.

International Land Use Change

An effort led by the Oak Ridge National Laboratory to use GIS globally, including any impact of bioenergy production on land use to understand and model drivers of land use change globally.

National Biorefinery Siting Model

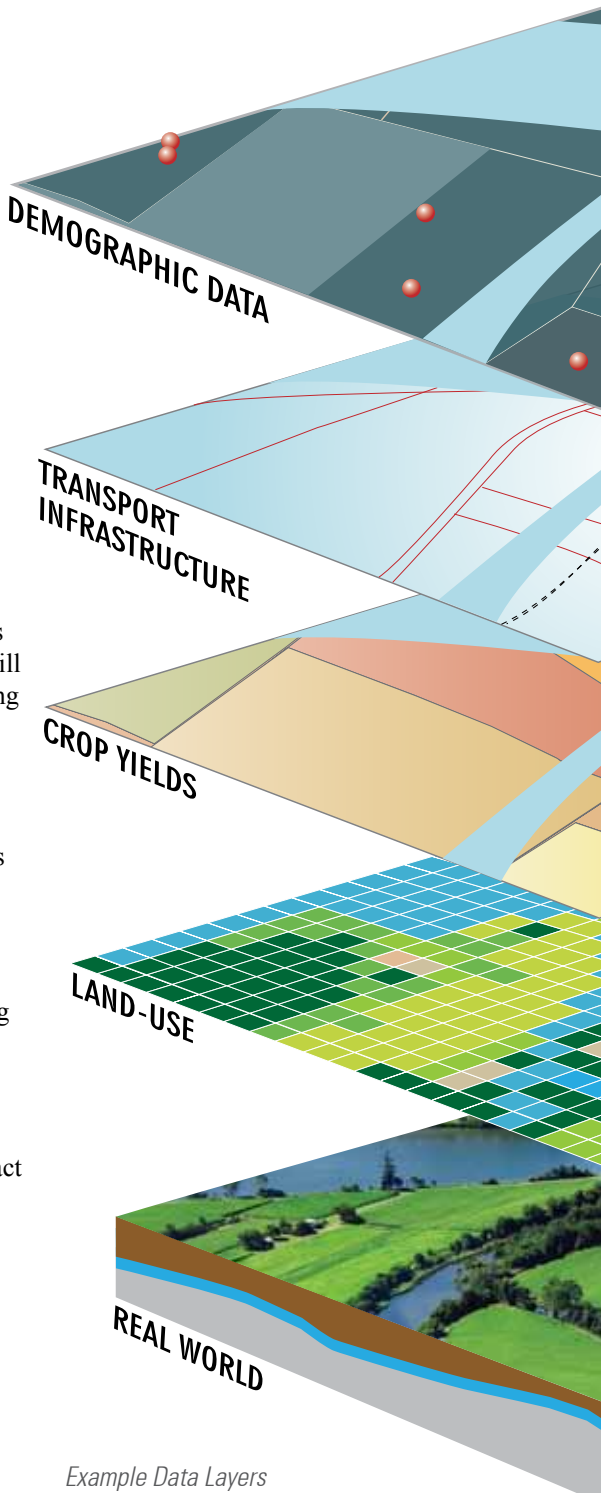
An initiative involving the Western Governors Association working with federal, national lab, and academic partners to develop a GIS-based, spatially resolved biomass supply and biorefinery optimization model for the United States.

Alternative Fuels and Advanced Vehicles Data Center

A National Renewable Energy Laboratory-led initiative to support alternative fuels by providing interactive maps of infrastructure, alternative fueling stations, and biomass production. This outreach helps fleets and consumers make transportation decisions and helps educate the public about the accessibility of alternative fuels and advanced vehicles.

Regional Land Use Change Modeling

An initiative at the Great Lakes Bioenergy Regional Center to link biogeochemical models of carbon dynamics, soil erosion, and nutrient loading to spatially explicit information on cropland in the Upper Midwest Region. This project will help understand and model the role of biofuels and land management as they relate to carbon sources and sinks.



Example Data Layers

EERE Information Center
1-877-EERE-INF (1-877-337-3463)
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