

ORNL Environmental Research and Future Directions

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ORNL is managed by UT-Battelle LLC for the US Department of Energy

Leading convergence research in biology, ecology, engineering, data discovery, physical sciences, and computing to advance U.S. competitiveness in the global bioeconomy and Earth system sustainability

- Biosciences Division
- Environmental Sciences Division
- Center for Bioenergy Innovation
- Climate Change Science Institute



SPRUCE – a glimpse of potential futures

Unique whole ecosystem manipulation experiment in forests of northern Minnesota

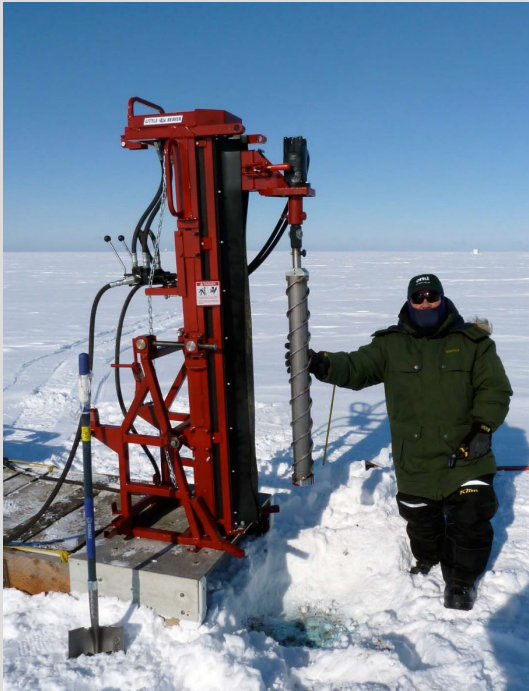
Plots are exposed to five different temperatures above and deep belowground. Half also receive elevated levels of carbon dioxide.



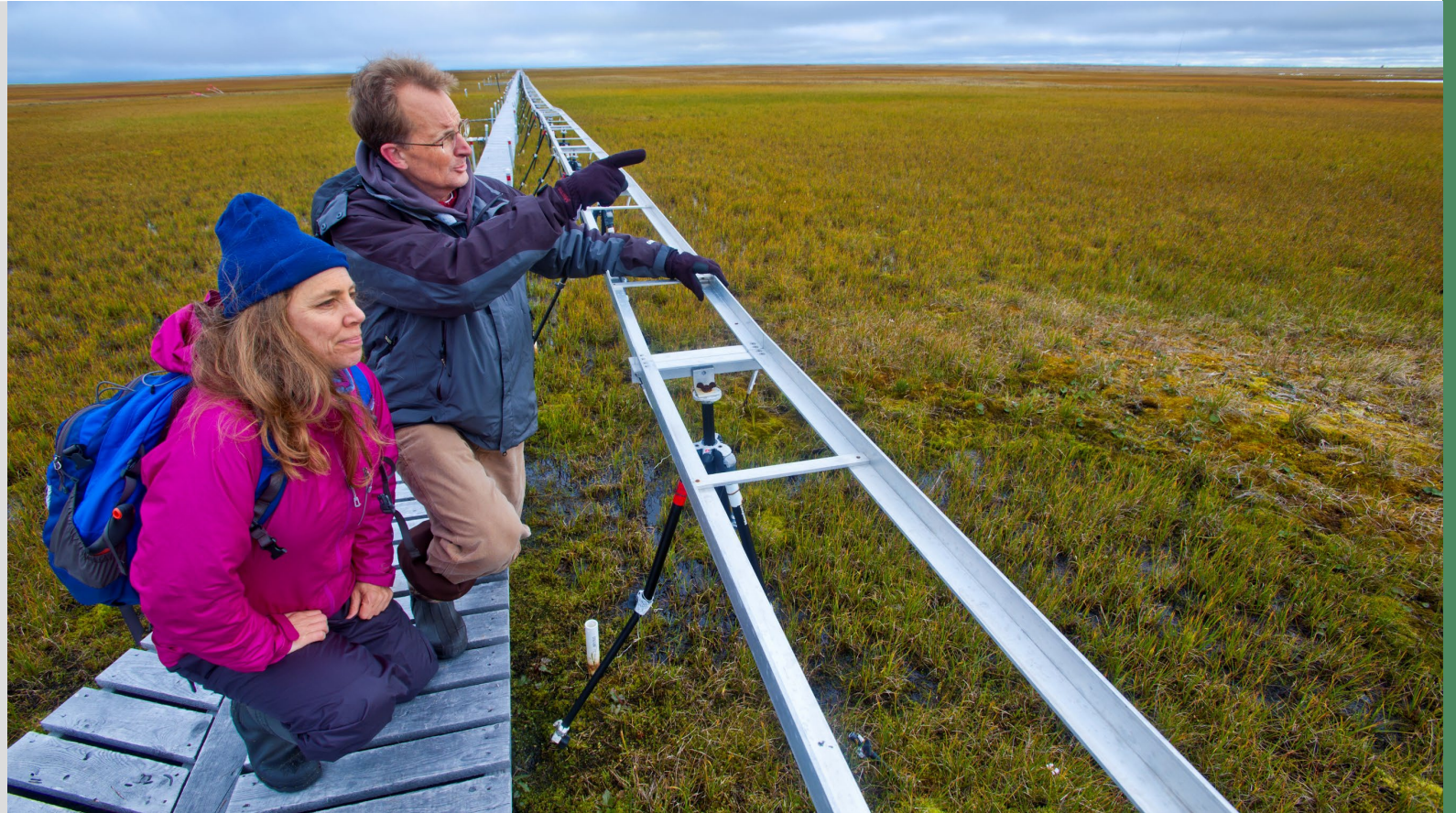
<https://mnspruce.ornl.gov>

Next-Generation Ecosystem Experiments Arctic

Advancing the predictive power of Earth system models through understanding of the structure and function of Arctic terrestrial ecosystems



Drilling ice cores



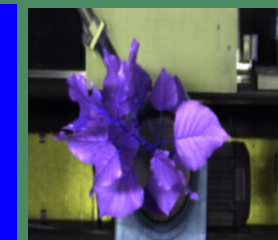
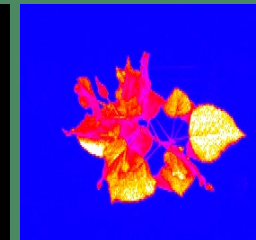
<https://ngee-arctic.ornl.gov>

Advanced Plant Phenotyping Laboratory

Provides high-resolution data to accelerate fundamental science investigations—connecting genotypes to phenotypes with applications for bioenergy, agriculture, and beyond



Five imaging stations



Aquatic Ecology Laboratory

Examining the impacts of various energy production strategies on aquatic ecosystems

Quantifying effects of toxicants on natural systems

Developing solutions to address mercury pollution



Climate Change Science Institute (CCSI)

Organization

- Scientists collaborate across four core areas of interest to climate change and globe change biology:
 - Earth system modeling
 - Data integration, dissemination, and informatics
 - Atmospheric Radiation Measurement Data Center
 - ORNL Distributed Active Archive Center for Biogeochemical Dynamics
 - Terrestrial ecosystem and carbon cycle science
 - Climate impacts, adaptation, and vulnerability science

Value Propositions

- Forward-looking research: We leverage expertise and core capabilities of ORNL to pursue unique science.
- Communicating a message: We equip members to communicate science to the public.
- Developing leaders: We provide opportunities to develop and execute leadership skills.
- Setting vision and direction: We aspire to have a strong presence on the national and international stage.

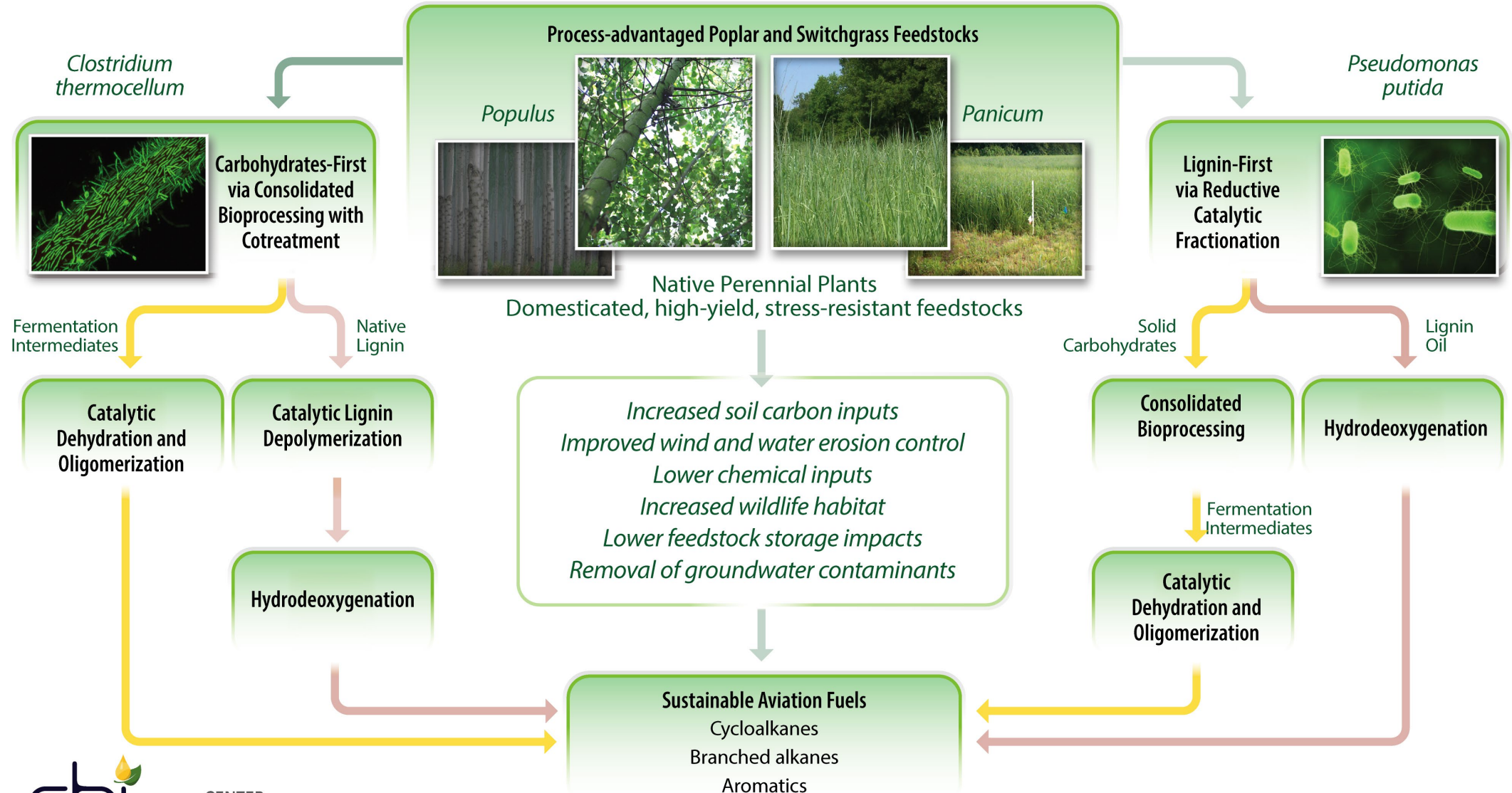
Outreach Activities

- Skype a Scientist
- RamSat with middle school
- NAS New Voices



Center for Bioenergy Innovation

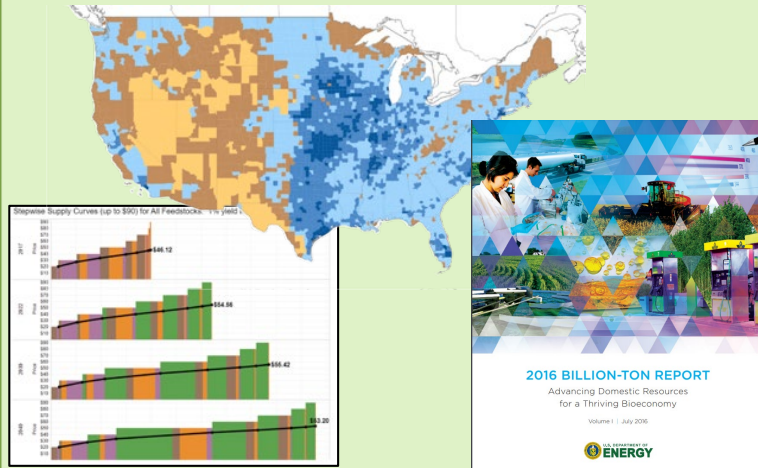
Accelerate domestication of bioenergy-relevant non-model plants and microbes to enable high-impact innovation across the bioenergy supply chain



Bioresource Science & Engineering Group - Quantifying sustainable biomass potential and deployment strategies

Biomass resource assessment

County-level assessments of biomass potential and optimal deployment scenarios



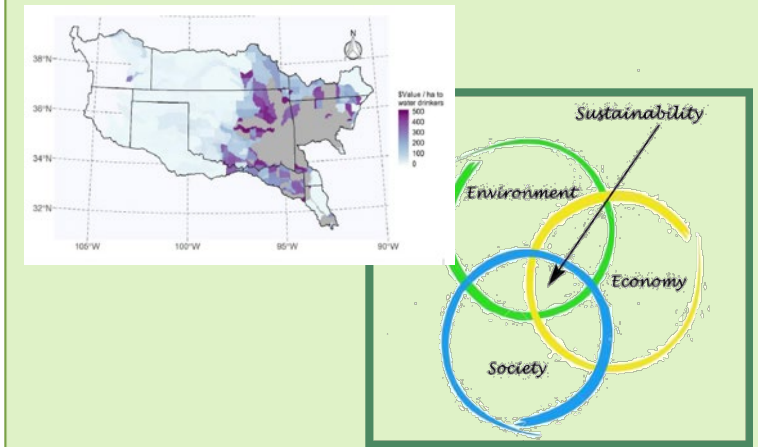
Biomass engineering and logistics

TEA/LCA of biomass supplies
Aligning biomass properties with applications

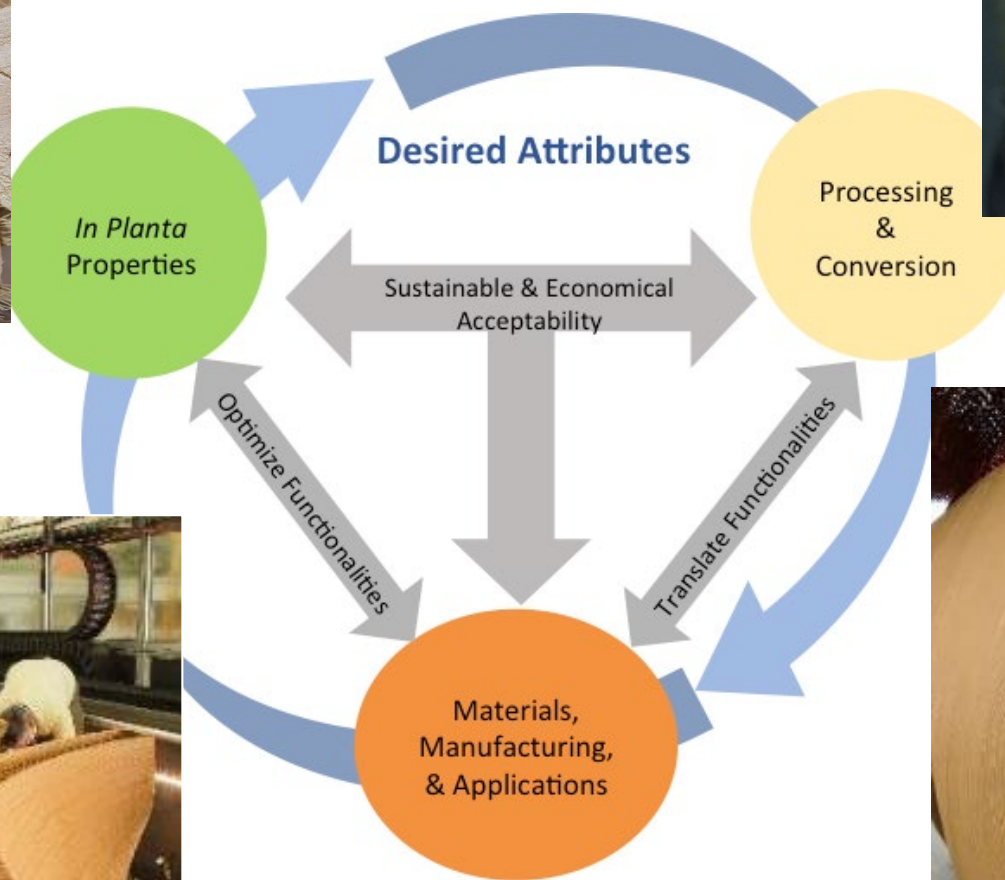


Sustainability studies

Sustainability indicators and modeling approaches for valuation of ecosystem benefits



Biomaterials research at ORNL





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