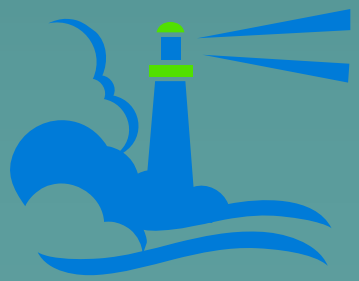
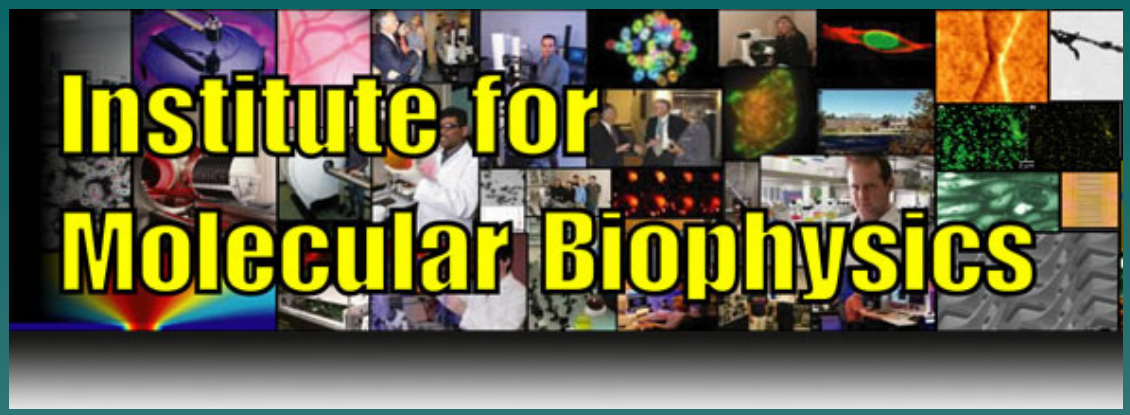
Maine NSF EPSCoR

Investing in Maine Research Infrastructure: Sustainable Forest Bioproducts
EPS-05-54545



Past Maine NSF EPSCoR RII Projects

Advanced Engineered Wood Composites (AEWC)



The University of Maine
Darling Marine Center

FBRI

FOREST BIOPRODUCTS RESEARCH INITIATIVE

Discovering

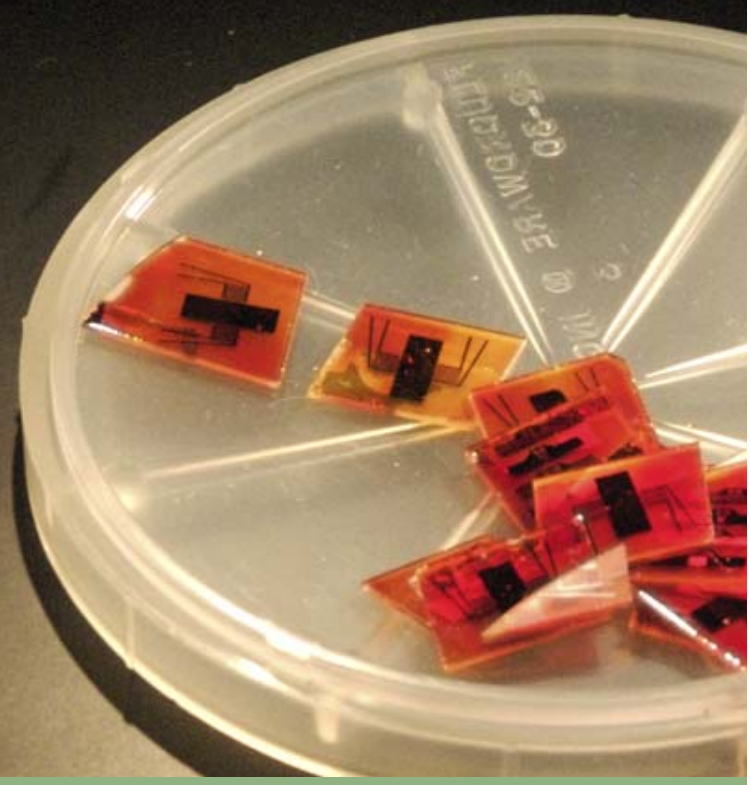
a Sustainable Bio-Economy

NSF EPSCoR

1865 THE UNIVERSITY OF MAINE

FBRI's Vision

To advance understanding about the scientific underpinnings, system behavior, and policy implications for the production of forest-based bioproducts that meet societal needs for materials, chemicals and fuels in an economically and ecologically sustainable manner.



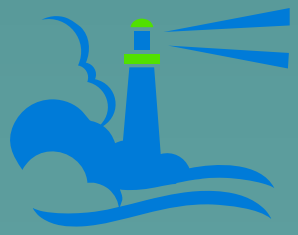
1865 THE UNIVERSITY OF MAINE

NSF EPSCoR

FOREST BIOPRODUCTS RESEARCH INITIATIVE

FBRI Project Highlights

- aligned with state's Target Technology Areas and Maine Science and Technology Action Plan
- builds on existing interactions of forestry, policy, science, technology, and industrial infrastructure that are present within the state
- provides critical state infrastructure through the creation of the Forest Bioproducts Research Initiative (FBRI) at the University
- catalyst for state's efforts to become globally competitive in this area
- lay groundwork for Maine's private sector to develop one of the world's first integrated forest biorefineries, which will demonstrate the commercial feasibility of the co-production of materials, fuels, and chemicals
- partners include the state's undergraduate and R&D institutions, industry, small businesses, government, K-12 education, non-profit and community organizations, and regional/national/international expertise in the field



FBRI Management Structure

Maine Office of Innovation &
Maine Science & Technology Advisory Committee

FBRI Management Team

Maine NSF EPSCoR Office Project Directors

FBRI Co-Director (Managing Director)

FBRI Co-Director (Science Director)

FBRI Associate Director (Landowner liaison)

FBRI Associate Director (Industry liaison)

Theme #1 Leader

Theme #2 Leader

Theme #3 Leader

Thrust #1 Leader

Thrust #2 Leader

Thrust #3 Leader

Thrust #4 Leader

Overall Project Goal:

Provide strategic programs and opportunities that will solidify and strengthen Maine's R&D capacity and competitiveness in the area of forest bioproducts research.

PROJECT OBJECTIVE #1:

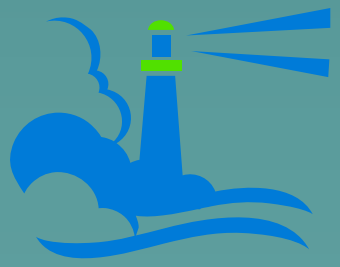
Advance cutting-edge science and engineering capabilities for discovery and innovation in this focus area in order for Maine's academic, non-profit, and for-profit R&D community to:

a) increase research capabilities

b) increase competitiveness & federal funding

c) acquire new technical skills & knowledge

d) develop new collaborations



PROJECT OBJECTIVE #2:

Enhance human resource development in this focus area:

a) for current researchers

b) for future researchers

PROJECT OBJECTIVE #3:

Improve the state's physical infrastructure in this focus area

PROJECT OBJECTIVE #4:

Show a positive economic impact

for the state by providing a solid scientific platform for the effective transfer of technology in this focus area from Maine's research institutions to the private sector.

FBRI's Core Research

From the forest floor to the factory floor, researchers, students, and project partners' goals are to:

Promote

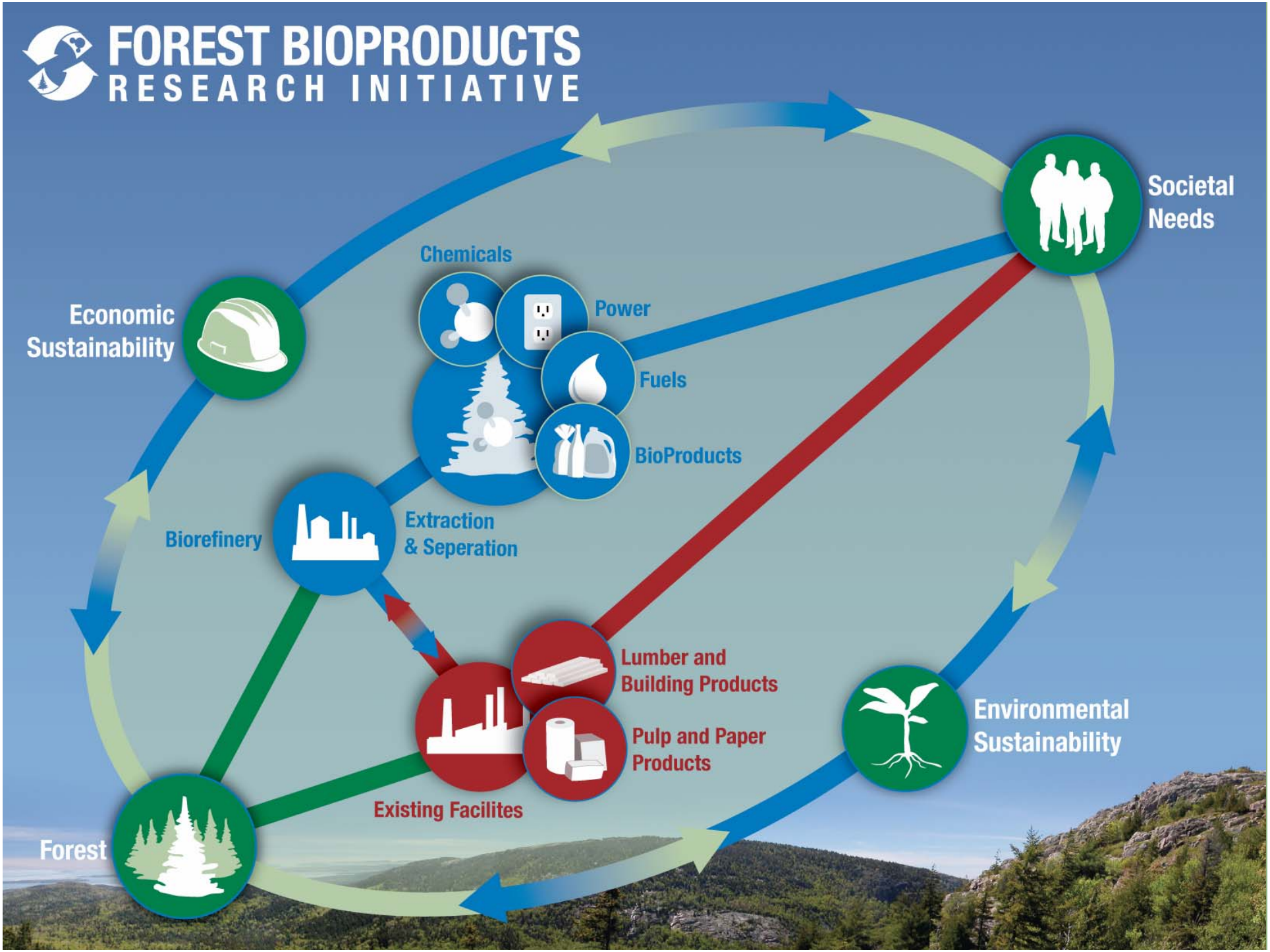
Forest Health for a Stable Bio-Economy

Understand

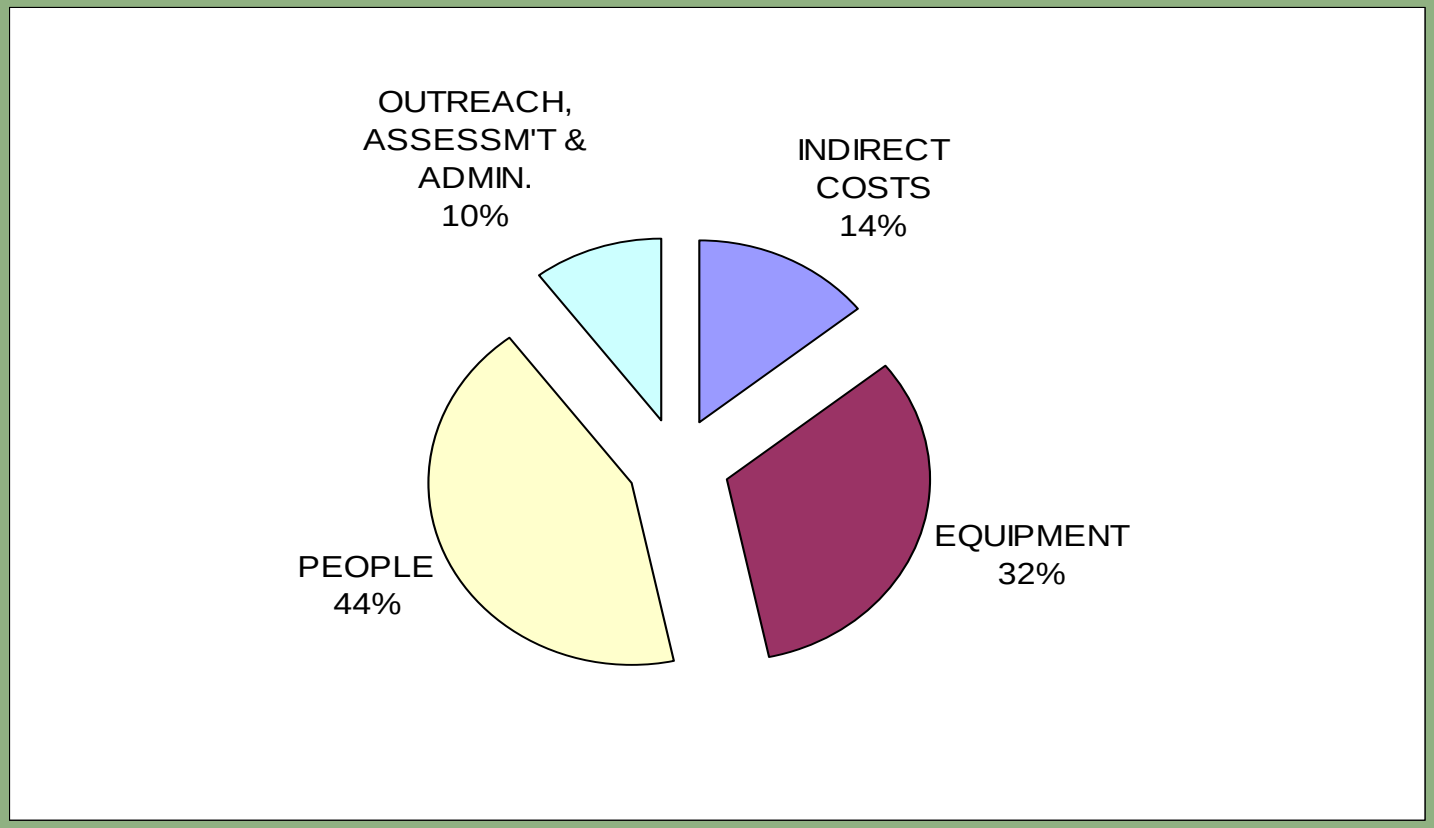
and Separate Wood Components

Create

and Commercialize New Bioproducts


FOREST BIOPRODUCTS
RESEARCH INITIATIVE
Societal Needs
Chemicals
Power
Fuels
BioProducts
Economic Sustainability
Biorefinery
Extraction & Seperation
Lumber and Building Products
Pulp and Paper Products
Existing Facilites
Environmental Sustainability
Forest

Infrastructure Investment – People and Equipment



Research Portfolio Overview

- 20 projects across 3 themes and 4 thrusts

Research Themes:

Promote Forest Health for a Stable Bio-Economy

Understand and Separate Wood Components

Create and Commercialize New Bioproducts

Research Thrusts

Bioprocessing
Nanotechnology
Human Dimensions
Thermal processing

Examples:

… Wood Extract Conversion
… Microfibrilated Cellulose (MFC) Study
… Stakeholder Attitudes Analysis
… Pyrolysis Oil and Syngas Upgrade

1865 THE UNIVERSITY OF MAINE

NSF EPSCoR

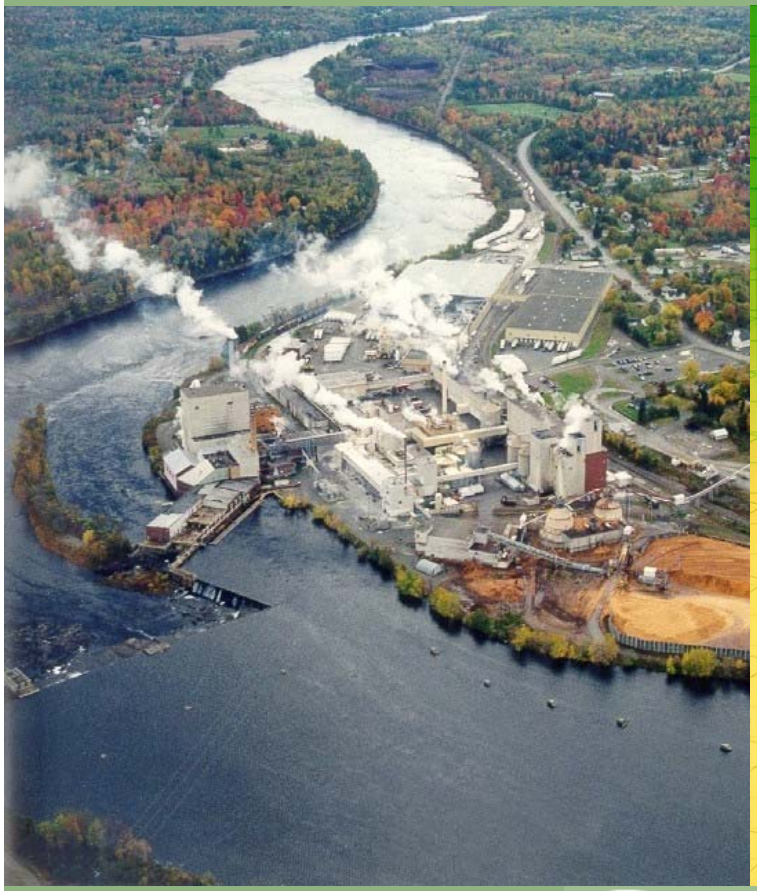
FOREST BIOPRODUCTS RESEARCH INITIATIVE

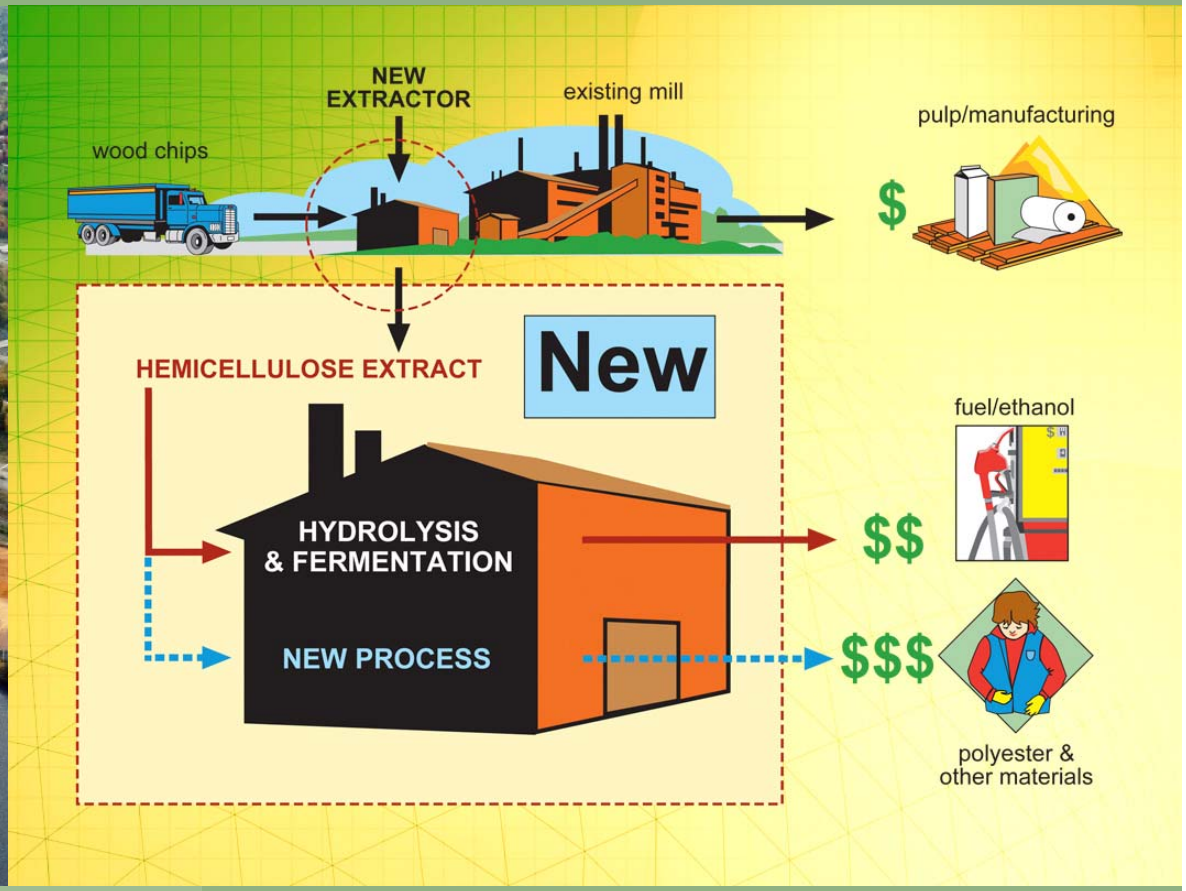

Rensselaer
VirginiaTech
Invent the Future
uop
A Honeywell Company
Armstrong
INL
Idaho National Laboratory
TATE & LYLE
CONSISTENTLY FIRST IN RENEWABLE INGREDIENTS
SEVEN ISLANDS LAND COMPANY
BANGOR, MAINE
CERTIFIED WELL-MANAGED FOREST
SCIENTIFIC CERTIFICATION SYSTEMS
Plum Creek
Growing Value from Exceptional Resources
SWOAM
Small Woodland Owners Association of Maine
STFI-PACKFORSK
THE UNIVERSITY OF MAINE
NSF EPSCoR
FOREST BIOPRODUCTS RESEARCH INITIATIVE

Partners - Industry

Red Shield Environmental, LLC (RSE Pulp & Chemicals)

Biorefinery Technology Demonstration ($60 million)
550 tonnes/day pulp &
2 million gal/yr ethanol facility





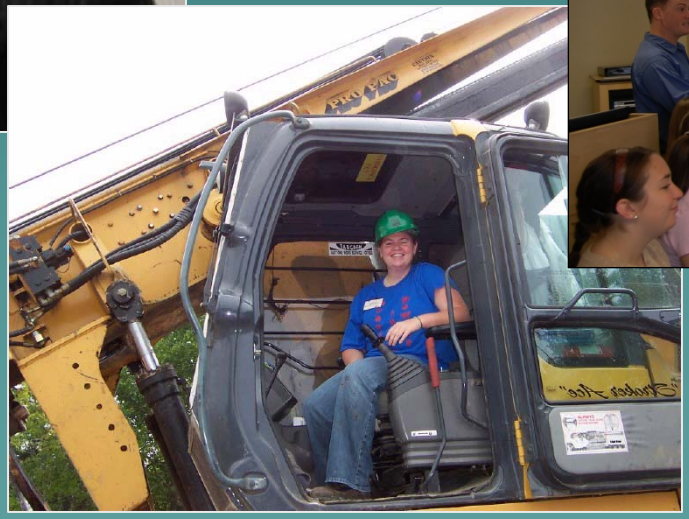
THE UNIVERSITY OF MAINE 1865

NSF EPSCoR

FOREST BIOPRODUCTS RESEARCH INITIATIVE

Maine NSF EPSCoR Outreach & Activities

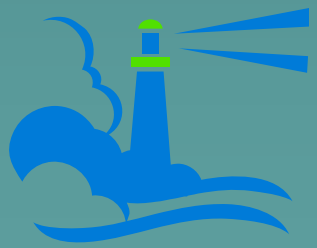
2006-2007



Science & Education Outreach

Over $340,000
outreach projects
supported to date

Accepting outreach proposals for YR2 round through March 2008



University of Southern Maine

- **Dr. John Wise, ME Center for Toxicology & Environmental Health, Portland**
  - Year 1 support for Dr. Wise, one graduate student, three high school students, small equipment
  - trained in toxicology studies of nanoparticles to prepare for larger study of cellulose bioproducts
  - Year 2 support for the graduate student, two of the YR1 high school students who are now USM undergraduates, and one more high school student.

- **Dr. Robert Kuech, Science Education for Teachers, Portland**

  Pod Casts of Science project trained 40 pre-service secondary science and elementary teachers in how to produce and utilize pod casts for science activities in their classrooms, using concepts related to forest and water ecology.

University of Maine at Fort Kent

- **Dr. Kim Borges-Therien, Environmental Studies**
  Undergraduate student internship to conduct an environmental research project involving the Cross Lake watershed.

- **Dr. Steven Selva, Biology & Environmental Studies**
  Travel funds to allow the completion of a research project on the biodiversity and ecology of a group of old-growth forest species.

- **Dr. Jeff Dubis, Forest Technology Program**
  Equipment for student and faculty training in low impact timber harvesting techniques for small landowners, including logging exercises, demonstrations, and workshops.

University of Maine, Farmington

- **Dr. David Correia, Geography / Dr. Drew Barton, Biology**

  Research project to utilize USDA Forest Service Forest Inventory Analysis data to compare the conservation outcomes of various forest certification programs in Maine. One undergraduate student was also supported.

- **Dr. Matthew McCourt, Social Sciences and Business**

  25 undergraduate students worked with community partners to develop and transfer forest “sketch maps” to Geographic Information Systems (GIS) methodology and maps that defined forest uses and values

Maine Small Business Initiatives

- **FDC Ventures: Scott Christiansen**
  Study of the reduction of barriers to the commercialization of pyrolysis systems in Maine by identifying regionally unique and viable co-product opportunities.

- **Tethys Research, Nancy Kravit**
  Research on improving woody biomass separation by enzymatic means. This will include isolating novel hemicellulose enzymes utilizing three microorganisms that they have discovered can generate fluorescence from their model compound.

- **Habitat Planning, Steven Young**
  Computer forest modeling development and community forest management plan development. One undergraduate student will be supported to collect field data and create GIS maps and databases. The project, already funded in part by the Maine Outdoor Heritage Fund, will also be conducted in partnership with local elementary and secondary schools of MSAD 33, the University of Maine at Fort Kent, and towns in the Upper St. John Valley of northernmost Maine.

Maine Nonprofit & K-12 Organizations

- **Maine TREE Foundation, Augusta**

  Teacher professional development activities throughout Maine. Three summer Forest of Maine Teacher Tour workshops for high school and middle school teachers. Six workshops for K-8 teachers and high school science and math teachers to learn about STEM careers, engage in related experiential learning, and obtain scientific equipment with which to conduct student research in the fields of forest bioproducts and alternative energy exploration.

- **Maine Energy Education Program, Parsonfield**

  Development of curriculum materials and an experiential activity to integrate information about energy from forest Bioproducts into existing alternative fuels presentations for Maine high school classrooms.

Nonprofit & K-12:

- **Troy Howard Middle School, Belfast**

  Establish a year-round environmental club, purchase equipment for classrooms, and plan a 2008 summer laboratory mathematics school based on environmental activities.

- **Leveraging the Maine Laptop Initiative for STEM**:

  560 middle school students and their teachers were introduced to high-end visualization tools where their laptop screens are combined to display a large, high-resolution image such as Maine forest “flyover” views.

- **Envirothon**:

  Provide more outreach to Maine high schools by Conservation District staff for encouraging greater participation and increased understanding of natural resource issues.

Additional UMaine Collaborations:

- **Wabanaki Native American Center (statewide tribal)**
  Support graduate & undergraduate research experiences, K-12 STEM programs, and special curriculum development.

- **Future Teachers' Academy, Dr. Owen Logue, College of Education & Human Development**
  Aspiring teachers from diverse backgrounds participated in the Future Teachers' Academy to take part in learning experiences in forestry, pulp & paper, engineering, biology, ecology, science, math, and environmental studies.

- **Maine Woods Online: An Information Sharing Forum for Educators and Students**
  The Maine Woods Web site was created, to provide information about Maine's forest lands, access to data sets, published information, and curriculum materials for K-12 teachers and the public.

UMaine Collaborations

- **Center for Science & Mathematics Education Research**

  Multiple forums for linking math and science teachers, pre-service educators, and FBRI faculty, including the University of Maine Mathematics and Science Future Teachers Club, the High School Physics Teachers' Collaborative, and the Mathematics Cross-Tier-Teaching-Team. Exchange of research-supported and content focused best practices in K-16 science and mathematics teaching and learning. Support for the 2008 National Summer Conference – Integrating Science and Mathematics Education Research into Teaching, and the Summer Academy.

- **Upward Bound Program:**

  29 low income/first generation high school student seniors were supported as they completed a research project during their final six-week residential summer experience. They conducted research, presented a project poster at a science fair, and prepared an article to be published in a special project book.

- **Student Innovation Center:**

  Innovation and Commercialization Plan competition for teams of undergraduate students to develop new commercial concepts in this field.

UMaine Collaborations

- **Forests for Maine's Future Public Expo:**
  The Center for Research on Sustainable Forests will assist in planning a day-long program of teaching and interactive workshop events for Maine youth at a March 2008 public expo, to be held in Portland, Maine.

- **Teaching Middle and High School Science Using Real Environmental Data:**
  A core group of middle and high school science and mathematics teachers will learn to apply specialized technology skills to answer environmental questions. Research supplies and equipment will be purchased, and each core group teacher will provide one-day workshops for their colleagues at their school, which will instruct them on how to implement an environmental research project with their students.

FBRI Faculty & K-12 Outreach

- **Expanding Your Horizons – March 2007:**

  STEM conference for 600 middle school girls

- **Consider Engineering – July 2006 & 2007:**

  week-long program for 60 high school juniors

- **Maine Tree Foundation:**

  professional development workshops for 100 teachers

Technical Assistance:
Conferences & workshops sponsored

- **Maine EPSCoR/IDeA State Conference:**
  Sept. 2007: plenary and break-out sessions - 150 participants
- **Grant Workshops:**
  5-workshop series January-May 2007 in cooperation with UMaine's Office of Research & Sponsored Programs and the Center for Teaching Excellence - 70 participants
- **DEPSCoR Workshop:**
  May 2006 – University of Southern Maine – 40 participants
- **NSF EPSCoR/USDA SBIR National Conference:**
  Oct. 2007 – 50 presenters & 150 participants
- **EPSCoR Workshops:**
  Oct. 2007 – statewide presentations on EPSCoR programs
- **FBRI Seminar Series & workshops**
  5-6 annual presentations by visiting scientists – 3 LCA workshops

Other Maine NSF EPSCoR Activities

- **NSF EPSCoR National Conference:**

  Nov. 2006 - 5 participants & Nov. 2007 – 7 participants
- **EPSCoR ASCEND Forum:**

  June 2007 - Building Center-Level Research – 2 participants
- **DOE EPSCoR National Conference: (NREL)**

  July 2007 – 5 participants
- **Funding Opportunities Database**

  2,000 entries for upcoming federal & private funding
- **Faculty Profile Database System**

  on-line reporting system for data collection
- **K-12 Outreach website**

  Best practices, links, resources, curriculum
- **Maine NSF EPSCoR website**

Objective #2: Human Resource Development

FBRI has provided direct salary support for 121 people throughout the state

- 27 core faculty
- 11 associate faculty at other institutions
- 6 technicians/professional staff
- 4 administrative positions
- 2 postdocs
- 27 graduate students
- 29 undergraduate students
- 15 high school students

Evaluation & Assessment

Four-pronged approach:

1) AAAS annual reviews
2) Advisory Board
3) NSF EPSCoR Office reverse site & site visits
4) Management team review of evaluation metrics & progress